
THE EVOLUTION OF STAKEHOLDER NETWORKS IN CONSTRUCTION PROJECTS

A COMPARATIVE ANALYSIS OF PROCUREMENT APPROACHES USING SOCIAL NETWORK
ANALYSIS FOR ENHANCED STAKEHOLDER MANAGEMENT

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Preface

This report marks the completion of my master's program in Construction Management and Engineering (CME) at the Eindhoven University of Technology. During my bachelor's internship, I developed a strong interest in project management due to its combination of technical and managerial aspects. In particular, I'm interested in the latest developments in this field. This study explores the application of Social Network Analysis (SNA) in the context of stakeholder management, with a specific focus on stakeholder dynamics.

I would like to thank my graduation supervisors from the TU/e, Qi Han, Theo Arentze, and Pei-Hsuan Lee, for their invaluable guidance throughout my graduation project. Their feedback helped elevate this thesis to a higher level. I also want to thank Brink for providing me the opportunity to conduct this study within their company, providing me access to project data and interview participants. In particular, I want to thank Onno Kassels, my company supervisor, for his valuable feedback from a practical perspective.

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Daan Dongelmans
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Summary

In construction projects, effective stakeholder management is critical to project success, yet effective strategies are lacking. Traditional static approaches neglect the dynamic character of stakeholder networks, despite their major influence on stakeholder attitudes and behaviors. Social Network Analysis (SNA) offers a promising solution, but empirical research applying SNA in construction projects, particularly longitudinal studies comparing different procurement approaches, is lacking. This research aims to fill this gap by examining the influence of the chosen procurement approach on stakeholder dynamics, ultimately aiming to improve stakeholder management throughout the project life cycle.

The first step in addressing this research objective was conducting a systematic literature review to identify the state-of-the-art knowledge on the research topic. The literature identifies six stakeholder management stages: identification, analysis, classification, prioritization, engagement, and monitoring. In this process, six Stakeholder Assessment SFs (SASFs) are considered Critical Success Factors (CSFs): assessing stakeholder attributes and behaviors, analyzing conflicts and coalitions, predicting influence, and determining strengths and weaknesses. Additionally, three types of stakeholder dynamics are identified: involved stakeholders, stakeholder relationships, and changes of attributes and characteristics of stakeholders. However, existing stakeholder analysis tools are considered inadequate as they ignore stakeholder interrelationships. SNA addresses this gap through quantitative network analysis. This study indicated that a multi-level approach (micro, meso, and macro) is essential, as each level provided distinct and valuable insights, collectively addressing five out of six SASFs, except for determining stakeholders strengths and weaknesses. Nevertheless, SNA remains primarily suited for research due to its time-consuming nature and the expertise required to interpret its results, limiting its practical applicability in daily project management.

Following the literature review, a longitudinal SNA was conducted on three procurement approaches: Design & Build (D&B), Design-Bid-Build (DBB), and Engineer & Construct (E&C), across six measurement points (initiative, preliminary design, final design, engineering, construction, and completion). Findings show that regardless of the chosen procurement approach, stakeholder networks are dynamic, exhibiting changes in terms of stakeholders, relationships, attributes, behaviors, interests, level of influence, and the overall network structure. While project managers are aware of stakeholder, behavioral, and interest-related dynamics, they lack awareness of changes in attributes, relationships, level of influence, and overall network structure. Stakeholder attributes include power and proximity, and stakeholder behavior is reflected in degree centrality (number of connections). Irrespective of the chosen procurement approach, the client, project management entity, and program manager are key stakeholders throughout the project, while the contractor is key from the engineering phase onwards. In DBB and E&C projects, architects and advisors are key from the preliminary design onwards. Moreover, in each case study, clusters are formed around the client and the internal project management entity at each phase, indicating their consistent central role.

This study showed that the procurement approach drives all aspects of stakeholder dynamics except relationship changes, which are driven by the client's internal knowledge, municipal land ownership, and wishes by the client. Internal client knowledge also drives changes in terms of stakeholders. Additionally, stakeholder roles and responsibilities impact stakeholder involvement as well as network structures. To effectively address these dynamics, a shift from static to dynamic stakeholder management is recommended. This involves revisiting the general stakeholder management process at each project phase with two added phases: relationship identification and network visualization. These additional phases address the limitation of conventional methods by considering the broader network without requiring full SNA implementation. Relationship identification tracks relationship changes, signaling necessary management adjustments. Network visualization offers quick insights into stakeholder positions, clusters, and bridges. Identifying clusters allows for a tailored approach for each stakeholder group, while bridges (stakeholders connecting separate clusters) require emphasis due to their influential position. Furthermore, stakeholder focus should shift at each project stage; the proposed framework can be used for this, which emphasizes focus should be placed on the key stakeholders. The required management approach for the architect and advisors, and contractor varies by the chosen procurement approach. Moreover, while all bridging stakeholders are key stakeholders, the opposite is not necessarily true. Highlighting the importance of bridge identification for identifying key stakeholders, as it can be done visually. An optimal stakeholder network structure further enhances stakeholder management through well-defined clusters, clear bridges managed by the central cluster (client, project management entity, and program manager), direct communication between powerful, influential, and reciprocally interested stakeholders, and a clear hierarchy to enhance communication and coordination.

In conclusion, this SNA study provides a deeper understanding of stakeholder dynamics in building projects within the European context and the impact of procurement choices. In addition, contributing to the development of enhanced stakeholder management strategies by moving towards a dynamic stakeholder management approach and establishing an optimal stakeholder network structure. Future research should assess the practical application of this proposal, analyze additional case studies, including private projects, and examine the impact of the 2024 Environment and Planning Act. Finally, the possibility of automating data extraction and analysis through large language models (LLMs) should be investigated.

Samenvatting

In bouwprojecten is effectief stakeholdermanagement cruciaal voor projectsucces, echter ontbreken effectieve strategieën. Traditionele statische benaderingen negeren het dynamische karakter van stakeholdernetwerken, ondanks hun grote invloed op de houding en het gedrag van stakeholders. Sociale netwerkanalyse (SNA) biedt een veelbelovende oplossing, maar empirisch onderzoek waarbij SNA wordt toegepast in bouwprojecten, met name longitudinale studies waarin verschillende bouworganisatievormen worden vergeleken, ontbreekt. Dit onderzoek beoogt dit onderzoekskloof op te vullen door de invloed van de bouworganisatievorm op de stakeholderdynamiek te onderzoeken, met als uiteindelijk doel het verbeteren van stakeholdermanagement gedurende de gehele projectlevenscyclus.

De eerste stap om dit onderzoeksdoel te behalen was het uitvoeren van een systematisch literatuuronderzoek om de meest recente kennis over het onderzoeksonderwerp te identificeren. De literatuur identificeert zes stadia in stakeholdermanagement: identificatie, analyse, classificatie, prioritering, betrokkenheid en monitoring. In dit proces worden zes succesfactoren voor stakeholderbeoordeling beschouwd als kritieke succesfactoren (KSF's): het beoordelen van stakeholderkenmerken en -gedrag, het analyseren van conflicten en coalities, het voorspellen van invloed en het bepalen van sterktes en zwaktes. Daarnaast worden drie soorten stakeholderdynamiek geïdentificeerd: betrokken stakeholders, stakeholderrelaties en veranderingen in eigenschappen en kenmerken van stakeholders. Bestaande tools voor stakeholderanalyse worden echter als ontoereikend beschouwd omdat ze de onderlinge relaties tussen stakeholders negeren. SNA adresseert deze beperking door middel van kwantitatieve netwerkanalyse. Deze studie toonde aan dat een analyse op meerdere niveaus (micro-, meso- en macroniveau) essentieel is, aangezien elk niveau afzonderlijke en waardevolle inzichten biedt en gezamenlijk vijf van de zes stakeholderbeoordelingssuccesfactoren adresseert, behalve het bepalen van de sterktes en zwaktes van stakeholders. SNA blijft echter voornamelijk geschikt voor onderzoek vanwege de tijdrovende aard en vereiste expertise om de resultaten te interpreteren, waardoor de praktische toepasbaarheid in dagelijkse projectmanagement beperkt blijft.

Na het literatuuronderzoek werd een longitudinale SNA uitgevoerd op drie bouworganisatievormen: Design & Build (D&B), Design-Bid-Build (DBB) en Engineer & Construct (E&C), over zes meetmomenten (initiatief, voorlopig ontwerp, definitief ontwerp, technisch ontwerp, bouw en oplevering). De bevindingen tonen aan dat, ongeacht de bouworganisatievorm, stakeholdernetwerken dynamisch zijn en veranderingen vertonen in termen van stakeholders, relaties, attributen, gedragingen, belangen, mate van invloed en de algehele netwerkstructuur. Hoewel projectmanagers zich bewust zijn van de dynamiek van stakeholders, gedrag en belangen, zijn ze zich niet bewust van veranderingen in attributen, relaties, mate van invloed en de algehele netwerkstructuur. Stakeholderattributen omvatten macht en nabijheid, en stakeholdergedrag wordt weerspiegeld in "degree centrality" (aantal verbindingen). Ongeacht de gekozen bouworganisatievorm zijn de opdrachtgever, de projectmanager en de programmamanager gedurende het hele project belangrijke stakeholders,

terwijl de aannemer vanaf de engineeringfase een belangrijke rol speelt. Bij DBB- en E&C-projecten spelen architecten en adviseurs een belangrijke rol vanaf het voorontwerp. Bovendien worden in elke casestudy clusters gevormd rond de opdrachtgever en de interne project manager in elke fase, wat hun consistente centrale rol aantoont.

Dit onderzoek toonde aan dat de bouworganisatievorm alle aspecten van de stakeholderdynamiek stuurt, behalve veranderingen in relaties, die worden gestuurd door de interne kennis van de klant, gemeentelijk grondbezit en wensen van de klant. Interne kennis van de klant is ook bepalend voor veranderingen in stakeholders. Daarnaast hebben de rollen en verantwoordelijkheden van stakeholders invloed op de betrokkenheid van stakeholders en op de netwerkstructuren. Om deze dynamiek effectief aan te pakken, wordt een verschuiving van statisch naar dynamisch stakeholdermanagement aanbevolen. Dit houdt in dat het algemene stakeholdermanagementproces in elke projectfase opnieuw wordt bekeken, met twee toegevoegde fasen: relatie-identificatie en netwerkvisualisatie. Deze extra fasen adresseren de beperking van conventionele methoden door het bredere netwerk in ogenschouw te nemen zonder dat een volledige SNA-implementatie nodig is. Relatie identificatie traceert relatieveranderingen en signaleert noodzakelijke management-aanpassingen. Netwerk-visualisatie biedt snel inzicht in stakeholderposities, clusters en "bridges". Het identificeren van clusters maakt een aanpak op maat mogelijk voor elke stakeholdergroep, terwijl "bridges" (stakeholders die afzonderlijke clusters verbinden) nadruk vereisen vanwege hun invloedrijke positie. Daarnaast dient de focus op stakeholders in elke projectfase te verschuiven; het voorgestelde raamwerk kan hiervoor worden gebruikt, dat benadrukt dat de focus moet worden gelegd op de belangrijkste stakeholders. De vereiste managementaanpak voor de architect en adviseurs en de aannemer varieert per gekozen bouworganisatievorm. Bovendien zijn alle "bridges" belangrijke stakeholders, maar het omgekeerde is niet perse het geval. Dit benadrukt het belang van "bridge-identificatie" voor het identificeren van belangrijke stakeholders, aangezien dit visueel kan worden gedaan. Een optimale stakeholdernetwerkstructuur verbetert het stakeholdermanagement verder door goed gedefinieerde clusters, duidelijke "bridges" die worden beheerd door het centrale cluster (opdrachtgever, projectmanagement en programmamanager), directe communicatie tussen machtige, invloedrijke en wederzijds geïnteresseerde stakeholders en een duidelijke hiërarchie ter verbetering van de communicatie en coördinatie.

Concluderend biedt deze SNA-studie meer inzicht in de dynamiek van stakeholders in bouwprojecten binnen de Europese context en de invloed van inkoopkeuzes op dit aspect. Daarnaast draagt het bij aan de ontwikkeling van verbeterde stakeholdermanagementstrategieën door een dynamische stakeholdermanagementbenadering en een optimale stakeholdernetwerkstructuur te hanteren. Toekomstig onderzoek moet de praktische toepassing van dit voorstel beoordelen, aanvullende casestudy's analyseren, waaronder private projecten, en de impact van Omgevingswet 2024 onderzoeken. Tot slot moet de mogelijkheid worden onderzocht om gegevensextractie en -analyse te automatiseren door middel van zogenoemde large language models (LLM's).

Abstract

In construction projects, effective stakeholder management is critical to project success, yet effective strategies are lacking. Traditional static approaches neglect the dynamic character of stakeholder networks, despite their major influence on stakeholder attitudes and behaviors. Social Network Analysis (SNA) offers a promising solution, but empirical research applying SNA in construction projects, particularly longitudinal studies comparing different procurement approaches, is lacking. This research examines the influence of the procurement approach on stakeholder dynamics to improve stakeholder management throughout the project life cycle.

A systematic literature review identified six stakeholder management stages and six Stakeholder Assessment Success Factors (SASFs). However, existing stakeholder analysis tools ignore stakeholder interrelationships. SNA addresses this gap through quantitative network analysis, where a multi-level approach (micro, meso, and macro) is essential. Nevertheless, SNA remains primarily suited for research due to its time-consuming nature and required expertise for interpretation.

A longitudinal SNA was conducted on three procurement approaches: Design & Build (D&B), Design-Bid-Build (DBB), and Engineer & Construct (E&C), across six measurement points. The study examined five of the six SASFs, excluding stakeholder weaknesses and strengths. Findings reveal that regardless of the procurement approach, stakeholder networks are dynamic, with changes in stakeholders, relationships, attributes, behaviors, interests, influence, and the overall network structure. Across all procurement approaches, the client, project management entity, and program manager consistently serve as key stakeholders, while the contractor is key from the engineering phase onwards. In DBB and E&C projects, architects and advisors are key from the preliminary design onwards. The procurement approach drives all stakeholder dynamics except relationship changes, which are driven by internal client knowledge, municipal land ownership, and client preferences.

To enhance stakeholder management, a shift from static to dynamic stakeholder management is recommended. Integrating relationship identification and network visualization into the general stakeholder management process, revisited at each phase. Providing insights into relationship changes, stakeholder positions, clusters, and bridges. An optimal stakeholder network structure further enhances stakeholder management through well-defined clusters, bridges, communication relationships, and hierarchy. In conclusion, this study deepens our understanding of stakeholder dynamics, highlights the impact of the procurement approach, and contributes to more effective stakeholder management strategies.

Keywords: *Social Network Analysis; Stakeholder management; Stakeholder dynamics; Stakeholder networks; Procurement approach.*

List of Abbreviations

ABM	Agent based modelling
CPM	Construction Project Management
CSFs	Critical Success Factors
D&B	Design & Build
D&C	Design and Construct
DBB	Design-Bid-Build
E&C	Engineer & Construct
EPC	Engineering, procurement, construction
FAHP	Fuzzy analytic hierarchy process
IFL	Information flow layer
LEs	Large enterprises
PPP	Public-private partnership
SASFs	Stakeholder Assessment Success Factors
SM	Stakeholder management
SMEs	Small and medium-sized enterprises
SNA	Social Network Analysis
UAC	Uniform Administrative Conditions for the Execution of Works and Technical Installation Works
UAC-IC	Uniform Administrative Conditions for Integrated contracts

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1. Introduction

The introduction section of this thesis starts with covering the background of this research. This is followed by outlining the problem definition and the research questions to tackle this identified problem. Subsequently, the objectives of this thesis and the research design are discussed. In the next section, the practical, social and scientific important of this study are described. Finally, the topics covered in the remainder of this thesis are discussed in the concluding section.

1.1 Background

A construction project, defined by a series of complicated activities, can be seen as a collaboration of stakeholders who jointly develop a project (Srinivasan & Dhivya, 2020; J. Yang et al., 2009). Proper identification, management, and influencing of the key stakeholders is critical for project success (Chung & Crawford, 2016). In terms of stakeholder management, the engagement of these key stakeholders is especially important (Ebekozi et al., 2024). Each of these stakeholders has diverse interests, as well as varying amounts and types of investments in the involved project (J. Yang et al., 2009). Because the project must address these diverse interests, stakeholders can have a significant impact on the project result (Oppong et al., 2017). Consequently, stakeholder management can be seen as an important aspect of project management (Assudani & Kloppenborg, 2010; Chung & Crawford, 2016; Srinivasan & Dhivya, 2020).

Despite the critical importance of stakeholder management, is there an absence of successful strategies, procedures, plans, or processes that project managers can use (R. J. Yang & Shen, 2015). Consequently, the construction industry is currently using an ineffective stakeholder management approach. This ultimately leads to project failure, a regular occurrence in the construction sector (Oppong et al., 2017). The traditional stakeholder management strategies use analytical approaches, including a range of tools, to identify, analyze, and then organize these stakeholders (Chung & Crawford, 2016). These strategies employ a traditional approach that divides stakeholders into static categories (Kujala et al., 2012). These analytical approaches are widely employed due to their qualities in the identification and engagement of stakeholders. Nevertheless, they have limitations since they do not take into consideration the influence of social networks. These networks form the essential structure of connections and relationships that shape, enable, and affect human behavior and interaction (Chung & Crawford, 2016). Additionally, these strategies are limited by the cognitive limitations of the project manager and inadequate demarcation of stakeholders as the project becomes larger and more complex (K. Y. Mok et al., 2015). According to Chung and Crawford (2016), a viable alternative to these traditional stakeholder management strategies are social network theories and stakeholder network analysis.

As a result of this growing awareness, projects are increasingly being seen as temporary network-based organizations (Taylor & Levitt, 2007; Turner & Müller, 2003). This view acknowledges that, unlike permanent organizations (e.g., firms), a construction project's organization is of a temporary nature and has a restricted lifespan. This temporary organization is purposefully structured to reach the objectives or goals of a permanent organization or specific shareholders by means of complicated problem-solving processes (Turner & Müller, 2003). To gain a greater understanding of these network-based organizations, there has been a rapid increase in research studies utilizing Social Network Analysis (SNA) in construction project management (Zheng et al., 2016). This tendency began in the 1990s, when SNA was being introduced into CPM research (Chinowsky & Taylor, 2012). This tendency resulted in a significant transition in construction management from merely economic metrics and systems monitoring towards a 'Network Perspective' (Malla et al., 2023). The fundamental purpose of this social network paradigm is that the arrangement of connections between actors and the roles of individual actors within the network significantly influence behavior, perceptions, and attitudes, both at the individual level and for the entire system (S. Knoke & Kulinski, 1992).

Adding another level of complexity to the social networks of construction projects is their dynamic character (Kereri & Harper, 2019). Which over time leads to alterations in the network's overall structure (Tabassum et al., 2018). This aligns with Freeman's (1984) view of seeing the stakeholder environment as dynamic instead of static. The changes of stakeholders over the course of the project are referred to as "stakeholder dynamics" (Aaltonen et al., 2015). These stakeholder dynamics cause major changes in stakeholder attitudes and behavior during the different construction project phases (Rowley, 1997). Consequently, there is a need for new stakeholder management strategies that can analyze these stakeholder dynamics to improve our understanding and management of them. Social Network Analysis (SNA) is considered a viable solution as it is able to capture these dynamics by using a series of static networks (Chung & Crawford, 2016; Ho et al., 2020).

1.2 Problem definition and research questions

The construction industry faces challenges in stakeholder management performance due to the lack of effective strategies, which negatively impacts project outcomes (Oppong et al., 2017; R. J. Yang & Shen, 2015). Traditional stakeholder management strategies use static analytical approaches, neglecting the dynamics of stakeholder networks, despite their major influence on stakeholder attitudes and behaviors (Chung & Crawford, 2016; Freeman, 1984; Kujala et al., 2012; Rowley, 1997). Consequently, there is a need for new stakeholder management strategies that can analyze these stakeholder dynamics to improve our understanding and management of them. In the literature, Social Network Analysis (SNA) is considered a viable solution as this methodology is able to analyze static as well as dynamic networks (Chung & Crawford, 2016; Tabassum et al., 2018). However, the concept of dynamic social networks is fairly new in SNA research (Ho et al., 2020), and there is a scarcity of empirical and mixed-methods research in construction-based SNA studies (Malla et al., 2023). In particular, there is a lack of longitudinal studies comparing the evolution of stakeholder networks between different procurement approaches, despite evidence that the social network structures differ between various procurement types (Hughes et al., 2015). As a result, future research is needed to deepen our understanding of how the chosen procurement approach affects the stakeholder dynamics of construction projects. This graduation project aims to contribute to filling this research gap. To this end, the following main research question has been formulated:

"How do stakeholder networks of different procurement approaches evolve during the life cycle of a construction project using Social Network Analysis (SNA), and how can these insights be used for enhanced stakeholder management?"

In order to properly answer the main research question, the following sub-questions are established:

- SQ1: What is the current state-of-the-art knowledge on stakeholder management, stakeholder dynamics, and the integration of SNA into stakeholder management?
- SQ 2: How do stakeholder network structures of different procurement approaches evolve during the life cycle of a construction project using SNA?
- SQ 3: How does the evolution of stakeholder network structures of different procurement approaches compare?
- SQ 4: What are the factors that drive the changes in the network structure?*
- SQ 5: How can the insights from the SNA be applied to enhance stakeholder management in construction projects?

* Sub-question 4 is only relevant on the assumption that there will be changes in the network structure. However, this assumption is considered valid because it is expected that there will be at least some changes in the actors present or their position within the network structure.

1.3 Objective of this thesis

This study's primary objective is to increase our understanding of the effect of the chosen procurement approach on stakeholder dynamics by means of a longitudinal Social Network Analysis (SNA) study. This is with the ultimate goal of improving stakeholder management throughout the project life cycle, leading to enhanced project outcomes. To achieve this objective, the study is divided into several sub-questions, which each address specific research objectives:

1. State-of-the-art knowledge (SQ1): To review the state-of-the-art knowledge on stakeholder management, stakeholder dynamics, and the integration of SNA into stakeholder management.
2. Network evolution (SQ2): To investigate how stakeholder network structures of different procurement approaches evolve throughout the life cycle of a construction project using SNA.
3. Comparison of network evolution (SQ3): To compare the evolution of stakeholders network structures of different procurement approaches, with the goal of identifying similarities and differences in the evolutionary patterns between these approaches.
4. Factors driving change (SQ4): To identify and analyze the factors that contribute to stakeholder network changes across the different phases of a construction project.
5. Application to stakeholder management (SQ5): To apply the insights gained from the conducted SNA to propose solutions for improving stakeholder management across the different phases of a construction project.

1.4 Research design

The research design of this study follows the same sequence as the earlier presented research questions. In Figure 1, an overview of the used research design is showed. This research design will be discussed in further detail in chapter 3 of this thesis.

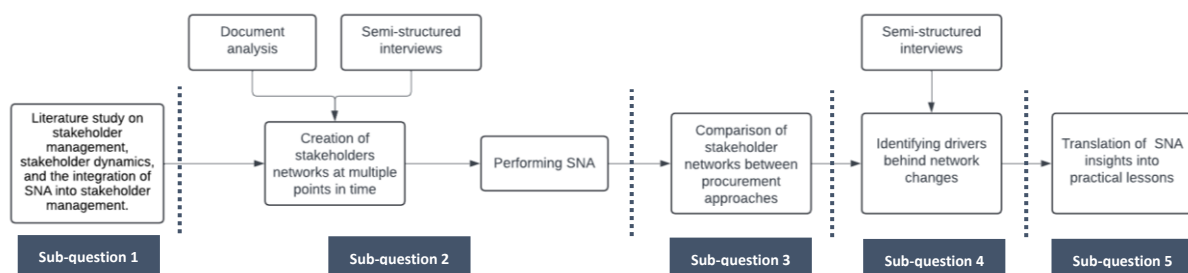


Figure 1: Research design

1.5 The Practical, social and scientific importance of this thesis

This research contributes to the academic field of Social Network Analysis (SNA) in construction project management by addressing a significant research gap. Specifically, this research focuses on the impact of the chosen procurement approach on the evolution of stakeholder networks throughout the project life cycle. Although construction-based SNA studies are increasingly being carried out in the academic field, there is a notable lack of longitudinal studies examining the impact of procurement approaches on stakeholder dynamics. By also investigating the drivers behind these network changes, this study provides a deeper understanding of stakeholder network dynamics, which are traditionally being studied as static. Moreover, by employing quantitative (e.g., SNA) and qualitative (e.g., interviews) research methods in real-life case studies, this research will provide empirical evidence and address the lack of mixed-methods construction-based SNA studies.

From a practical perspective, this research has significant practical relevance for project managers in the construction industry. The findings of the research will contribute to the development of more effective stakeholder management strategies, which are currently lacking (Yang & Shen, 2015). By using the insights from SNA, project managers will better understand how stakeholder networks evolve over time. By increasing awareness and knowledge of stakeholder dynamics, this can help improve the stakeholder management process. Because stakeholder management is a critical component of project success, the findings of this research will ultimately lead to improved project outcomes. Finally, the integration of theoretical insights from the literature and insights from practice ensures that the findings are relevant and applicable in practice. Improved stakeholder management strategies also hold societal relevance, especially in terms of enhanced stakeholder engagement. This will ensure that the diverse set of interests of stakeholders, including local residents and businesses, are considered and addressed throughout the project life cycle.

1.6 Reading guide

This thesis starts with conducting a literature review on the state-of-the-art knowledge on the key components of this study, namely, stakeholder management, stakeholder dynamics, and the integration of SNA into stakeholder management. The used approach and the results of this literature review will be discussed in Chapter 2. The insights from the literature review will answer sub-question one. Chapter 3 describes the methodology and the selected case studies for answering sub-questions two to five. In Chapter 4, the results of the SNA are presented for each of the separate case studies, which provides an answer to sub-question two. In the next chapter, the case studies are compared to identify similarities and differences, given an answer to sub-question three. Chapter 6 discusses the study's results, including the drivers of network changes and how SNA insights can enhance stakeholder management of construction projects throughout the project life cycle. This chapter provides answers to sub-questions four and five. The final chapter contains a conclusion, which provides critical reflection on the research conducted and recommendations for future research.

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2. Literature review

In this chapter, a literature review is performed on the current state-of-the-art knowledge on stakeholder management, stakeholder dynamics, and the integration of SNA into stakeholder management. These three concepts have been chosen as they form the core of this study. The intent of this review is to present a comprehensive, well-organized synthesis of knowledge on the subject of study. For this purpose, a systematic literature review is employed, which is a research approach that uses a methodical process to collect, identify, and review available research (Pati & Lorusso, 2018). Based on this analysis, critical points in the present knowledge of the subject can be identified, highlighting areas that require additional exploration (Kitchenham et al., 2009). For this systematic literature review, the PRISMA framework is applied, which is the abbreviation for "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (Page et al., 2021). An important initial step within this framework is stating the research objectives that this review addresses (Page et al., 2021), those are the following:

- To identify and review existing studies on the concept of stakeholder management
 - To identify the concept of a stakeholder
 - To identify the concept of stakeholder management
 - To identify the available tools for analyzing stakeholders and their limitations
- To identify and review existing studies on the concept of stakeholder dynamics
- To identify and review existing studies that apply Social Network Analysis (SNA) to stakeholder management of construction projects
 - To identify the fundamental principles of Social Network Analysis (SNA)
 - To examine the methodological approaches that have been applied in prior conducted research
 - To identify the types of construction projects that have been previously studied
 - To identify the captured findings of previously conducted research

Following the research objectives, a search strategy needs to be established. The keywords, information sources, and inclusion and exclusion criteria that were employed are all described in this search strategy (Page et al., 2021). Full disclosure of the search strategy should improve the systematic review's transparency, support replication, and make it easier to update (Faggion et al., 2018; Lefebvre et al., 2019). In the following section, the employed search strategy in this review is discussed.

2.1 Search strategy

To get a comprehensive understanding of the current state of knowledge on the subject, a combination of two databases, namely Scopus and Google Scholar, is used. Scopus was chosen as its database contains high-quality scientific papers. On the other hand, Google Scholar provides access to additional sources that are not published on Scopus. In these two search engines, searches are being made on the basis of a search query that consists of a combination of keywords. Based on the research questions this review seeks to answer, the following list of keywords and their synonyms and abbreviations was compiled; see Table 1.

Table 1: Keywords

Keywords	Synonyms/Abbreviations
Social Network Analysis	SNA
Stakeholder dynamic*	Stakeholder change* OR stakeholder network change* OR network change* OR network dynamic* OR network evolution*
Stakeholder management	Stakeholder analysis OR stakeholder engagement
Construction project*	Building project*

Stakeholder analysis and stakeholder engagement are not official synonyms of stakeholder management but are part of this concept (Project Management Institute, 2021). Therefore, they are also taken into account as keywords.

As the aim of this systematic literature review is to identify the state-of-the-art knowledge on the subject, a set of inclusion and exclusion criteria is established. To ensure that the knowledge presented in this review reflects the current state-of-the-art developments, papers published prior to 2019 are excluded. This indicates that this review focuses on research from the past five years, roughly covering the period from 2019 to 2024, recognizing that 2024 is not yet fully completed. In addition, the paper must be published in the English language to ensure that the contents can be understood. Papers that are written in other languages are excluded from this review. Furthermore, only journal articles are included in this research due to high scientific quality of these papers. This means that conference papers, theses, and books are excluded from this review. This exclusion is especially important when using Google Scholar since its database also contains a lot of sources that do not meet the high scientific standards as the articles in Scopus do. Finally, only fully accessible papers are included in this review. On the basis of these inclusion and exclusion criteria and the earlier presented keywords, the following search queries have been established:

Scopus: *(TITLE-ABS-KEY ("Social Network Analysis" OR "SNA") AND ("Stakeholder management" OR "Stakeholder analysis" OR "Stakeholder engagement") AND ("Construction project*" OR "Building project*")) OR (TITLE-ABS-KEY ("Construction project*" OR "Building project*")) AND ("Stakeholder dynamic*" OR "Stakeholder change*" OR "Stakeholder network change*" OR "Network change*" OR "Network dynamic*" OR "Network evolution*")) AND PUBYEAR > 2018 AND PUBYEAR < 2025 AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j")) AND (EXCLUDE (DOCTYPE, "cp"))*

Google Scholar: ("Social Network Analysis" OR "SNA") AND ("Stakeholder management" OR "Stakeholder analysis" OR "Stakeholder engagement") AND ("Construction project*" OR "Building project*") AND "journal article" -thesis -conference -book

&

("Construction project*" OR "Building project*") AND ("Stakeholder dynamic*" OR "Stakeholder change*" OR "Stakeholder network change*" OR "Network change*" OR "Network dynamic*" OR "Network evolution*") AND "journal article" -thesis -conference -book

In Google Scholar, it is not possible to make use of the OR (TITLE-ABS-KEY) as is in Scopus; therefore, the search query is split into two separate ones. Furthermore, it is not possible to include criteria related to language and year of publication directly in the search query. Therefore, these filters are applied immediately after the search. Finally, it is not possible to select a filter on journal articles; therefore, "journal article" is added to the search query. However, this method is not completely flawless, as a journal article can also be mentioned in the text of the paper. Therefore, in the initial screening, articles that are not part of a journal are removed from this review.

In this search strategy, Social Network Analysis (SNA) and stakeholder management were searched as separate concepts. This decision is made intentionally, as this otherwise would lead to an overwhelming number of papers, approximately a thousand. Processing such a large number of papers is not feasible in the scope of this research. Therefore, a more targeted approach of combining the two concepts into one search query has been chosen. Furthermore, stakeholder dynamics are not searched on specifically in relation to Social Network Analysis (SNA). This decision was also made intentionally to also grasp general insights on stakeholder dynamics in construction projects. To ensure that key papers discussing SNA in relation to stakeholder dynamics in construction projects are not neglected, the following validation queries have been established:

Scopus: TITLE-ABS-KEY ("Social Network Analysis" OR "SNA") AND ("Construction project*" OR "Building project*") AND ("Stakeholder dynamic*" OR "Stakeholder change*" OR "Stakeholder network change*" OR "Network change*" OR "Network dynamic*" OR "Network evolution*") AND PUBYEAR > 2018 AND PUBYEAR < 2025 AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (LANGUAGE, "English"))

Google Scholar: ("Social Network Analysis" OR "SNA") AND ("Construction project*" OR "Building project*") AND ("Stakeholder dynamic*" OR "Stakeholder change*" OR "Stakeholder network change*" OR "Network change*" OR "Network dynamic*" OR "Network evolution*") AND "journal article" -thesis -conference -book

If additional insights on the key components of this study are deemed necessary, the snowballing method will be used. This method will also be applied if the search strategy does not result in the minimal number of 30 papers. The snowballing method uses forward searching, which searches articles by citations, and backward searching, which searches by reference list (Wohlin et al., 2020).

2.2 Search overview

Using the search query described above resulted in the following search overview presented in a flowchart format in Figure 2.

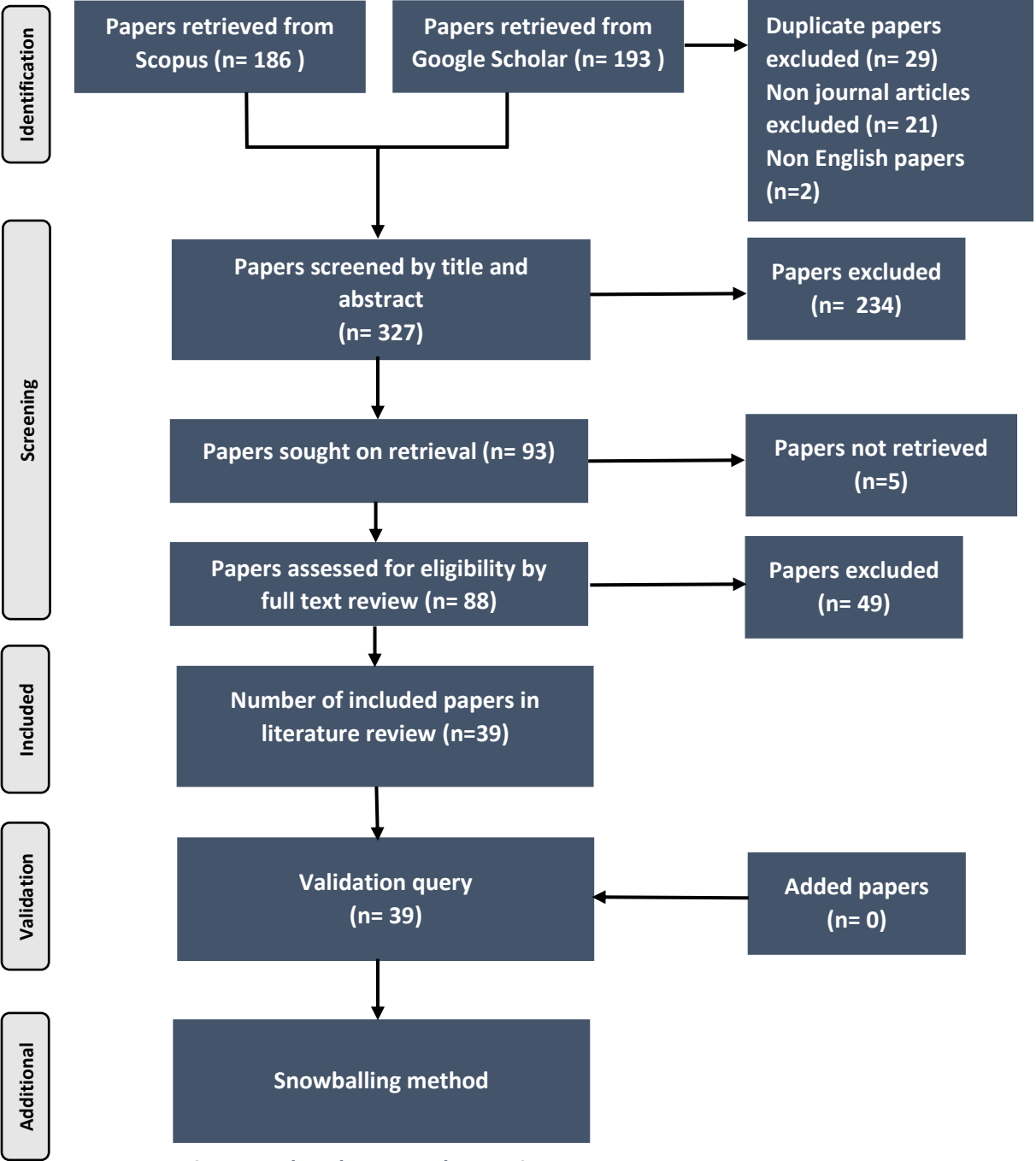


Figure 2: Flowchart search overview

2.3 Synthesis matrix

Table 2 provides an overview of the 39 articles included in this systematic literature review. All of these articles are categorized according to the three main components of this study: stakeholder management, stakeholder dynamics, and integration of SNA into stakeholder management. If a particular article addresses one of the main components, it is indicated by an "X".

Table 2: Synthesis matrix of components

No.	Author & year	Stakeholder management	Stakeholder dynamics	SNA + Stakeholder management
1	(G. Wu et al., 2020)	X	X	
2	(Chen et al., 2024)			X
3	(Jafari et al., 2020)			X
4	(L. Liu et al., 2021)		X	X
5	(Sharpe et al., 2021)	X		
6	(Tampio, Haapasalo, Haapasalo, et al., 2022)	X		
7	(Bahadorestani et al., 2020)	X		
8	(D. Wang et al., 2021)		X	X
9	(Koc et al., 2023)		X	
10	(Huang et al., 2023)			X
11	(C. Liu et al., 2022)			X
12	(Erkul et al., 2019)	X	X	
13	(Uddin et al., 2023)			X
14	(S. Wang et al., 2019)			X
15	(Zhuang et al., 2019)			X
16	(Tang et al., 2020)		X	X
17	(Loosemore et al., 2020)		X	X
18	(Gao et al., 2020)			X
19	(Eyiah-Botwe et al., 2020)	X		
20	(Dadpour et al., 2019)			X
21	(Bahadorestani et al., 2019)	X		
22	(J.-R. Lin & Wu, 2021)			X
23	(Y. Wang et al., 2020)	X		X
24	(J. Xue et al., 2020)	X		
25	(W. Wu et al., 2020)			X
26	(Hewa Welege et al., 2021)			X
27	(Oppong et al., 2021)	X		
28	(Q. Li et al., 2021)		X	X
29	(H. Xue et al., 2023)		X	X
30	(Badi et al., 2022)		X	X
31	(Y. Wang et al., 2022)		X	X
32	(D. Wang et al., 2023)			X
33	(X. Xia & Xiang, 2023)		X	X
34	(Türesoy et al., 2024)	X		

35	(Alhassan, 2024)		X
36	(Corazza et al., 2024)		X
37	(Halder, 2024)		X
38	(H. Lin et al., 2024)		X
39	(Zheng et al., 2024)	X	X

2.4 Synthesis

The following section provides a synthesis of the state-of-the-art knowledge on the three key components of this study: Social Network Analysis (SNA), stakeholder dynamics, and stakeholder management and their integration.

2.4.1 Stakeholder management

What is a stakeholder?

In the literature, various definitions for the term stakeholder are used; however, the most widely recognized is the definition of Freeman (Y. Wang et al., 2022). According to Freeman (1984), who introduced the term, it is defined as “any group or individual who can affect or is affected by the achievement of the firm’s objectives.” As such, they hold a stake in the outcome and are thus referred to as stakeholders (E. Chinyio & Olomolaiye, 2009). These stakeholders occupy different positions within a project, which can either positively or negatively affect the project (Oppong et al., 2017). Mitchell et al. (1997) claim that a stakeholder is only able to impact the project when possessing power, legitimacy, and urgency, or at least two of these attributes. Stakeholders also have diverse interests, which are also conflicting (Aapaoja & Haapasalo, 2014).

Typically, stakeholders are divided into internal and external stakeholders (G. M. Winch, 2004). Which are also referred to as primary (internal) and secondary (external) stakeholders (Cleland, 1998). Internal stakeholders are those who are formally a part of the project coalition and, as such, generally support the initiative (G. M. Winch, 2004). Internal stakeholders are in charge of the management and delivery of the project and usually have legal agreements with one another (N. Xia et al., 2017). The government is considered a unique kind of internal stakeholder since it may take on the roles of owner and supervisor (X. Xia & Xiang, 2023). Clients, owners, architects, contractors, subcontractors, service, process, and material suppliers, along with staff members, consultants, financiers, and shareholders, are all additionally considered internal stakeholders (Newcombe, 2003; Smith & Love, 2004).

External stakeholders, on the other hand, are being impacted by the project and have the ability to influence it, even though they are not formally part of the project organization (Aaltonen, 2011; Walker et al., 2008). These external stakeholders possess the legitimacy to impact the project through financial factors, public opinion mobilization, and broadened pressures (Teng et al., 2017). According to Ward and Chapman (2008) the local government, local communities, regulatory agencies, environmental groups, the media, and future users can all be considered external stakeholders.

Stakeholder management: the concept

According to Olander (2007), stakeholder management (SM) is the methodical identification, analysis, and planning of activities to interact with and impact stakeholders. Karlson (2002) endorses that stakeholder management involves the identification of stakeholders and mentions for the stakeholder analysis specifically the evaluation of stakeholders' interests and impacts. Moreover, he argues that stakeholder management also entails setting objectives, allocating resources, and describing operational specifics; reporting evaluation findings; developing stakeholder management techniques; and monitoring its effectiveness. Further expanding on this concept, Chinyio and Olomolaiye (2009) emphasize that SM also includes stakeholder classification in addition to stakeholder identification.

This stakeholder management process starts with the identification of stakeholders, followed by performing a stakeholder analysis (Winch & Bonke, 2002; Mok et al., 2015). During the stakeholder analysis process, investigations are carried out regarding the stakeholders' positions, interests, influences, networks, and other aspects related to their past, present, and prospective future states (Tampio, Haapasalo, Haapasalo, et al., 2022). On the basis of the stakeholder analysis, stakeholders are classified (Aapaoja & Haapasalo, 2014). The results of this stakeholder classification are often displayed as stakeholder maps, for instance, by means of a power/interest matrix (Mitchell et al., 1997; Olander, 2007; Olander & Landin, 2005). Stakeholder analysis is considered a crucial step in the stakeholder management process as it provides the management with the necessary information to comprehend the stakeholder environment and create effective engagement strategies (Mok & Shen, 2016). While total inclusion would be the ideal outcome of stakeholder engagement efforts, this is not often the case in practice. Consequently, a stakeholder prioritization is needed (Sharpe et al., 2021).

Stakeholder engagement, a key step of the stakeholder management process, is known as the practice of engaging, involving, and building connections with stakeholders in order to realize ideal values (Chinyio & Akintoye, 2008; Greenwood, 2007). Two stages of stakeholder engagement were defined by Deegan and Parkin (2011): (1) involvement, which is a greater level of engagement that reduces stakeholder opposition to a project, and (2) participation, which is a way of providing information and consulting to raise stakeholders' awareness of a project. Stakeholder engagement's ultimate purpose is to realize project ideals and maximize stakeholders' satisfaction during the course of the project. Managers must have a clear engagement plan in order to accomplish this goal. Stakeholder expectations and project needs should inform the development of this strategy (Bahadorestani et al., 2020). Stakeholder engagement has been considered one of the most critical elements in the effective completion of a project, and this need is only growing (Leung et al., 2013; Park et al., 2017). Moreover, Oppong et al. (2021) emphasize the importance of ongoing assessment of stakeholder satisfaction with respect to established engagement strategies. Finally, this stakeholder management process can be considered an iterative cycle due to the dynamic nature of the stakeholder environment.

Based on these insights, the conclusion can be drawn that the stakeholder management encompasses six distinct stages: identification, analysis, classification, prioritization, engagement, and monitoring. Accordingly, the following iterative cycle can be constructed; see Figure 3.

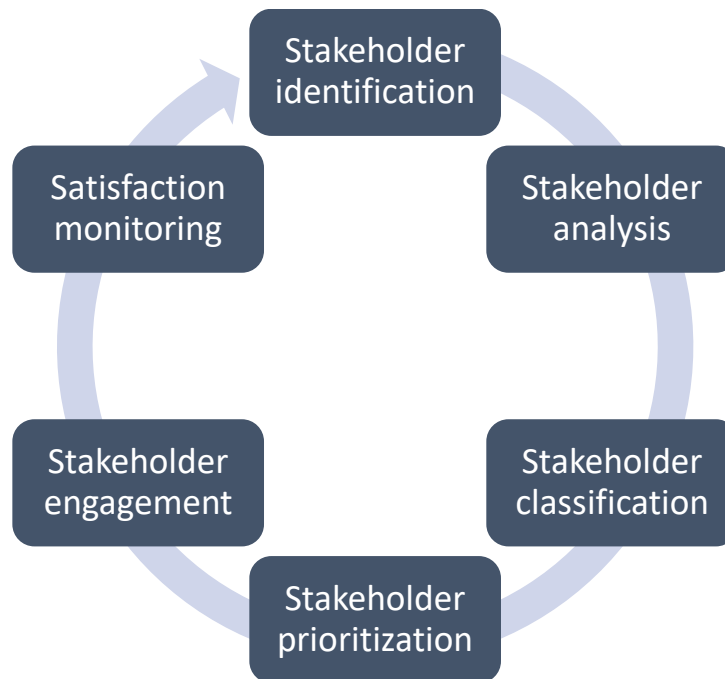


Figure 3: Stakeholder management process

To ensure an effective stakeholder management process throughout this cycle, it is important to recognize the critical aspects of this process. This can be achieved by focusing on Critical Success Factors (CSFs), which are characterized as “areas, in which results, if they are satisfactory, will ensure successful competitive performance for the organisation” (Rockart, 1979). The latest insights on this topic are presented by Oppong et al. (2021), which are based on earlier research by Oppong et al. (2017). Since Social Network Analysis can aid the process of stakeholder analysis, which forms the important basis for the classification and prioritization of the stakeholders, only the CSFs related to this step are further discussed. These CSFs are referred to as Stakeholder Assessment SFs (SASFs) in the paper of Oppong et al. (2017); see Table 3 for an overview of these SASFs.

Table 3: Stakeholder Assessment SFs (SASFs) (Oppong et al., 2017)

No.	Description
1	Assessing attributes (power, urgency and proximity) of stakeholders
2	Assessing stakeholders' behaviors
3	Analyzing conflicts and coalitions amongst stakeholders
4	Understanding areas of stakeholders' interests
5	Predicting the influence of stakeholders accurately
6	Determining the strengths and weaknesses of stakeholders

Available stakeholder analysis tools

Among the stakeholder characteristics and attributes included in the SASFs presented above, stakeholder salience is considered a primary metric (Tampio et al., 2022b). Scholars have proposed many stakeholder typology models, based on the stakeholder salience attributes of power, legitimacy, and urgency (Bahadorestani et al., 2019). The purpose of a stakeholder typology model is to show managers who matters and what characteristics of a stakeholder are most important in identifying, evaluating, and managing those stakeholders (Elias, 2016; Mitchell et al., 2017). According to this systematic literature review, the most well recognized methods are: the salience model, stakeholder circle methodology, power/interest matrix, and impact/probability matrix (Bahadorestani et al., 2019, 2020; Sharpe et al., 2021; Tampio, Haapasalo, Haapasalo, et al., 2022; Y. Wang et al., 2020; J. Xue et al., 2020).

1. The salience model

The salience model developed by Mitchell et al. (1997) is one of the most widely recognized stakeholder analysis method in the literature as it has been cited more than 15,000 times (Sharpe et al., 2021). In this tool stakeholders are evaluated on the basis of three attributes: power, legitimacy, and urgency. These attributes are backed by solid empirical and sociological evidence (Bahadorestani et al., 2019). Based on these three attributes stakeholders are classified in eight classes: (1) dormant-, (2) discretionary-, (3) demanding-, (4) dominant-, (5) dangerous-, (6) dependent-, (7) definitive- and (8) non-stakeholder. As seen in Figure 4, the attributes' presence provides the basis for the categorization. The most important stakeholders are those whom possess all three attributes (Mitchell et al., 1997). The degree of management attention a stakeholder receives should be in accordance with their importance, meaning that those with the greatest importance receive more attention (Aapaoja & Haapasalo, 2014).

In the paper by Bahadorestani et al. (2019) a revised version of the original model by Mitchell et al. (1997) is proposed. This can be considered the current state-of-the-art salience model. Two adjustments are made to the original version. First, this model adds a fourth attribute: proximity. Secondly, the attribute potency is used instead of power because it includes both attributes of influence and impact, of which power is a subset. These changes are grounded on semi-structured interviews with experts from the construction industry and a literature review.

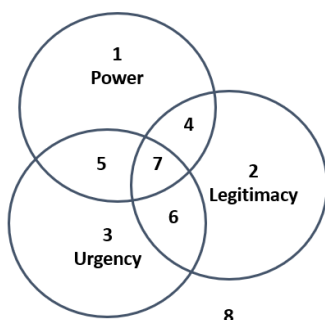


Figure 4: Salience model (Mitchell et al., 1997)

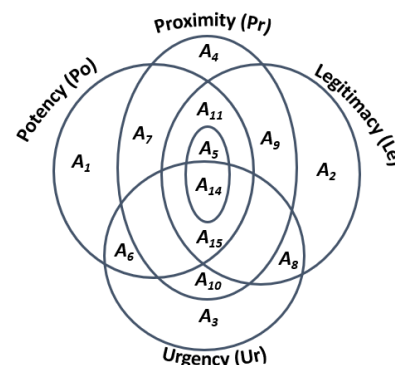


Figure 5: Salience model (Bahadorestani et al., 2019)

In this study the following definitions of the attributes are adopted:

- **Potency:** The capacity and possibility to impact the internal and external factors pertaining to projects and their outcomes by enforcing demands (social, political, and personal, etc.), irrespective of whether these are legal or illegal (Bahadorestani et al., 2019).
- **Legitimacy:** A value or principle that sparks emotions like passion or hatred, fosters loyalty, sets adaptive rules, justifies legal frameworks, or establishes legal relationships based on the norms, beliefs, and definitions within a social system or external to it in the context of a project (Bahadorestani et al., 2019).
- **Urgency:** The extent to which responding to requests from stakeholders requires quick action in disregard of other work obligations when the project (claims) and its outcomes are significant for the stakeholders as well as the project itself (Bahadorestani et al., 2019).
- **Proximity:** The distance that separates a stakeholder's active involvement and participation from that of the project (Bahadorestani et al., 2019).

2. Stakeholder circle methodology

The stakeholder circle methodology was developed by Bourne and Walker (2005) as a stakeholder prioritization method. The methodology uses a visualization tool to display the relative importance of stakeholders based on three factors: power, proximity, and urgency (Figure 6). Their tool gives users a series of scoring criteria to ascertain the extent to which a stakeholder group possesses every attribute, as opposed to inquiring whether or not each stakeholder group possesses a particular attribute. Furthermore, rather than considering every attribute as equally important, this tool allows for assigning weights to the attributes (Sharpe et al., 2021).

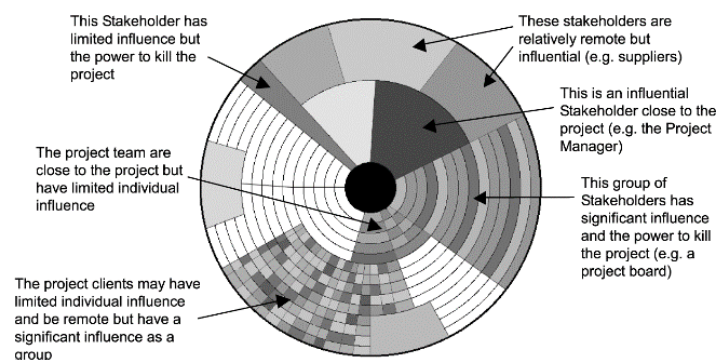


Figure 6: Stakeholder circle methodology (Bourne & Walker, 2005)

3. Power/interest matrix

The power/interest matrix was introduced by Johnson and Scholes (1999) classifies stakeholders into four groups according to their level of interest and power (Figure 7). Based on the classification, the model describes the best method to manage this type of stakeholder. Due to its simplicity it's a quick method to use. However, the limitation of its simplicity is that it neglects other stakeholder attributes by only taken into account the stakeholders' power and interest.

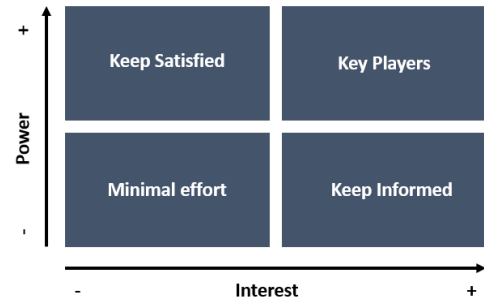


Figure 7: Power/interest matrix (Johnson & Scholes, 1999)

4. Impact/probability matrix

As previously emphasized by Johnson and Scholes (1999), there is a need to classify stakeholders on the two dimensions of power and interest. Olander (2007) argues however that it is difficult to measure power; instead, one should evaluate each stakeholder's impact on the project. Moreover, in the same manner, interest level represents an estimation of the likelihood that a stakeholder would influence project choices. On the basis of these two statements, this author proposed the impact/probability matrix (Figure 8). In this figure, it can be seen that the same quadrants as in the power/interest matrix of Johnson and Scholes (1999) are adopted.

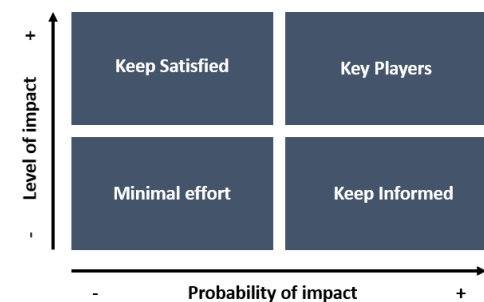


Figure 8: Impact/probability matrix (Olander, 2007)

While these models discussed above offer guidelines for assessing stakeholders' significance based on projects' relationships with stakeholders, they have interpreted stakeholder analysis as characterizing stakeholder categories individually. This is considered inadequate as the mutual relationships between stakeholders are crucial in complex project environments (K. Y. Mok et al., 2015; J. Yang et al., 2011). According to Mok et al. (2015), the earlier described method of SNA, makes up for this limitation by providing a thorough quantitative analysis of the stakeholder connections within the network. As a result, the traditional stakeholder typology models and SNA can be considered as complementary methods.

2.4.2 Stakeholder dynamics

A construction project's life cycle comprises several phases that the project goes through from its initiation to completion. A project phase is a group of coherently connected project tasks that lead to the creation of one or more deliverables. Phases may occur in a consecutive, repetitive, or overlapping manner (Project Management Institute, 2017). In general, a construction project follows the phases of initiation, definition (planning and design), construction, handover commissioning, operation, and maintenance (Guan et al., 2020; Q. Li et al., 2020; Y. Li et al., 2022). Whereas in specific contexts there is also a phase of demolition before construction (Q. Li et al., 2020; Y. Li et al., 2022). When the project goes through these phases, it is subject to stakeholder dynamics. In the literature, three types of stakeholder dynamics are mentioned:

1. **Changes of involved stakeholders (nodes):** During the life cycle of a construction project, some actors may enter the project later, while others leave at different times, depending on the fulfillment of designated tasks and obligations (Kereri & Harper, 2019).
2. **Changes of relationships between stakeholders (links):** During the project, also the relationship between stakeholders changes (Oppong et al., 2021). Similarly, Kereri and Harper (2019) argued that the various social factors (e.g., communication) between project participants may change over time. Moreover, W. Wu et al. (2020) describe the strength of relationships and trust across enterprises as a dynamic process. A similar statement is being made in the paper of G. Wu et al. (2020).
3. **Changes of attributes and characteristics of stakeholders (nodes):** According to Aaltonen et al. (2015), stakeholders' characteristics and attitudes toward the project change over time. In addition, stakeholder behavior and interests are dynamic (Oppong et al., 2021). These dynamics also hold for the stakeholder's attributes (Oppong et al., 2021; J. Yang et al., 2009).

2.4.3 Integration of SNA into stakeholder management

Social Network Analysis (SNA): the concept

To conceptualize Social Network Analysis (SNA), it is first important to understand its origins. The concept of SNA stems from the early 1930s, with the publication of Jacob Moreno's book "Who shall survive?". In this book, Moreno introduced the sociometric method as a tool for understanding the patterns of social connections formed within small groups (Moreno, 1934). In Social Network Analysis (SNA), graphs are constructed to examine this social structure. These graphs, commonly referred to as sociograms, consist of nodes that represent the actors within the network and links that indicate the relationships between these nodes (Jafari et al., 2020). In sociograms, each node is depicted by a polygon or other shape (usually a circle). Lines are used for connecting adjacent related nodes, representing the presence of a link between them. In general, directed links are represented by arrows, where the arrowhead indicates the direction to the receiving node (Butts, 2008). An example of a social network is shown in Figure 9.

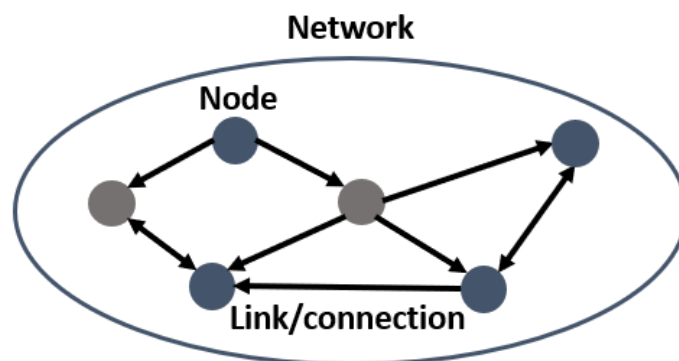


Figure 9: Representation of a social network (Uddin, 2017)

According to Wasserman and Faust (1994), five types of nodes can be distinguished based on their level of connectivity. The first type is an "isolate" node, indicating that the node has no connections at all. The second type is a "transmitter" node, indicating that the node has only outgoing connections and no incoming ones. The next type is called a "receiver" node, indicating that the node has only incoming connections and no outgoing ones. A "carrier" node, the fourth type, indicates that the node has an equal number of incoming (in-degree) and outgoing (out-degree) connections. The final type is the "ordinary" node, which indicates that the node does not fit into any of the previously listed categories.

The creation of a social network is usually linked to an actor's need to obtain some type of resource (e.g., information) from other people (Uddin, 2017). In the context of a construction project, a social network is the representation of the construction team, consisting of a variety of individuals from different backgrounds, including the owner, (sub)contractors, engineers, architects, and suppliers. To sustain their professional relationships and perform their tasks, construction team members engage and communicate with each other in a variety of ways. This interaction forms a social network between the various parties (Kereri & Harper, 2019).

In Social Network Analysis (SNA), the configuration of connections between various network nodes in a social network is identified (Borgatti et al., 2013). Building on this, SNA is applied to understand the characteristics and consequences of these structures by examining the intricate relationships between different network components (Dowding, 1995). For this purpose, SNA applies a variety of quantitative methods to specify the attributes of individual network nodes as well as the network as a whole (Borgatti et al., 2013). These methods are supported by a comprehensive theoretical framework based on graph theory, which employs various mathematical metrics (Marin & Wellman, 2011; Pryke, 2012). Since structural notions are difficult to express in ordinary language, specific terminology and notation are used, also largely drawn from graph theory. As part of the field of mathematics, graph theory focuses on discrete relational structures (Butts, 2008). The mathematical metrics derived from this framework can be categorized into node-level and network-level metrics (Bolíbar, 2016). Node-level metrics focus on individual nodes to provide an understanding about their role in the network (Y. Wang et al., 2020). Network-level metrics, on the other hand, focus on the network as a whole, specifically on the network connectivity, in order to acquire a greater understanding about how network actors interact (Franco-Trigo et al., 2020).

In the context of these metrics, two types of networks can be distinguished: ego-centric and whole-centric networks. In ego-centric networks, an individual node's local network is analyzed, meaning that only the nodes directly connected to this ego are considered (Hatala & Lutta, 2009). In contrast, whole-centric networks analyzes each connection among a bounded group of actors (Hatala, 2006; Wasserman & Faust, 1994). Therefore, this type of network is also called a bounded network (Scott, 2000).

In addition to producing numerous valuable insights into the underlying network structure by means of this quantitative analysis, SNA also offers a way to simplify the visualization of complex social networks (Presenza & Cipollina, 2010). For this purpose, SNA employs the earlier mentioned sociograms (Jafari et al., 2020). To apply SNA effectively, the following phasing is generally used: (1) defining the social network boundary; (2) evaluating node-to-node interactions; (3) visualizing the network; (4) examining the network's properties; (5) displaying the analysis's findings (Huang et al., 2023). In Figure 10, this described process is visualized.

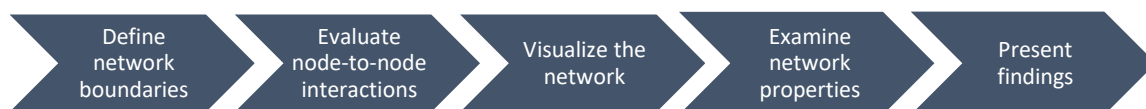


Figure 10: Social Network Analysis (SNA) process (Huang et al., 2023)

Application of SNA in Construction Stakeholder Networks

On the basis of this systematic literature review, two clusters of research focus can be distinguished: collaboration and information networks. The collaboration network studies primarily focus on identifying the stakeholders and their interrelationships within the collaborative network. Whereas the information network studies primarily focus on the flow of information within such a network.

1. Collaboration networks

In the paper by Liu et al. (2022), SNA is used to investigate the features of the cooperation of construction companies of various sizes. Wherein the distinction is being made between large enterprises (LEs) and small and medium-sized enterprises (SMEs). In contrast, Uddin et al. (2023) compared the collaboration network of a public, private, and its combination in the form of a public-private partnership (PPP). Conversely, Wang et al. (2019) analyzed the network of only one project from an owner's viewpoint. A similar analysis was conducted by Halder (2024), who analyzed the landscape of stakeholder governance for a large infrastructure project. In addition to the standard analysis of a collaboration network, the paper of Zhuang et al. (2019) linked the factors of interest and knowledge level to the network structure. Finally, in contrast to the manual approaches used in the previously stated studies, Lin and Wu (2021) developed a framework for executing an SNA in an automated manner.

2. Information networks

Chen et al. (2024) created a two-layer network with an information flow layer (IFL) and an information demand layer (IDL), which they analyzed by making use of SNA. Similarly to this research is the study of Wang et al. (2021), who also analyzed an information exchange network but specifically focused on a PPP. In the paper of Jafari et al. (2020), on the other hand, they made the relation between a communication network and the change management process. Comparable to this research is the study of Alhassan (2024), who also analyzed a communication network but made the link towards project delay. In contrast to the other studies, the study of Gao et al. (2020) simulates the impact of changes in the metrics of the communication network by combining SNA with agent-based modeling (ABM). Their case study specifically focused on an engineering, procurement, and construction (EPC) project.

Types of SNA studies

Static vs longitudinal studies

In terms of SNA studies, a distinction can be made between static studies, which create a network structure at a certain point in time, and longitudinal studies, which use multiple measurement points. In these longitudinal studies, the dynamics of stakeholder networks are being captured. On the basis of this literature review, it can be concluded that a small majority (13 out of 25) of the research studies made use of a static approach. However, multiple scholars stress the importance of dynamics and mention this as a research limitation of their static study. For instance, Chen et al. (2024) emphasize the importance of exploring dynamic network evolution over time. As they argue, this will assist researchers in comprehending the complex process of collaboration at a deeper level.

Fortunately, this systematic literature review identified 12 dynamic SNA studies. These studies all created a number of static networks at a certain point in time to capture the dynamics of stakeholder networks. At minimum two and at maximum eight phases of a construction project have been considered. However, these studies have evaluated the stakeholder dynamics in different contexts, which will be further discussed in this section. For instance, Zheng et al. (2024) analyzed the dynamic character of a collaboration structure in the context of a brownfield project by assessing four key stages: preliminary preparation, demolition, construction, and operation and maintenance. A similar dynamic assessment of a stakeholder network was performed by Loosemore et al. (2020). However, they took insights from different projects instead of only one and specifically concentrated on Design and Construct (D&C) projects. They distinguished four project phases: project scope/feasibility, tendering/estimating, design development/project planning, and construction/handover. In another context, Xue et al. (2023) analyzed the dynamic character of a collaboration network of prefabricated construction projects. For this purpose, they employed three measurement points: design stage, production stage, and on-site installment stage.

Badi et al. (2022), in contrast, analyzed a consultancy network for a construction project using the three phases of collect, consider, and create. Wang et al. (2022) examined the dynamic character of the stakeholder network of an urban regeneration project. They distinguished a decision-making phase, the expropriation and demolition phase, the construction phase, and the operation and maintenance phase. While Wang et al. (2023) specifically focused on the involvement of the influence of stakeholders in a PPP, identifying five stages: initiation and planning, procurement, construction phase, operation phase, and transmission phase.

Furthermore, in some papers, another dimension is added to the stakeholder network. For instance, in the paper by Xia and Xiang (2023), they integrated the social risks within the network, tracking dynamics across three stages: planning, construction, and operation stage. Whereas the study of Tang et al. (2020) created a stakeholder-cost risk network. To capture the dynamics of this process, they considered four project phases: initiating, organizing, performing, and concluding the project. In the article by Dadpour et al. (2019), they added another concept by adding stakeholder concerns to collaboration. To assess the dynamic character of this network, they created four static networks in time: initiation, planning, execution, and project closure.

Unlike the other articles that do not distinguish between the application of BIM or not within collaboration, Wang et al. (2020) do include this in their study. To capture the dynamics of this network, they utilized the same approach of creating a number of static networks. Similarly Li et al. (2021) also analyzed the application of BIM in a construction project, but they captured the dynamics by comparing two stages within the construction phase. Another difference is that they made the distinction between the formal and informal networks. Finally, In the paper by Lin et al. (2024), SNA have been combined with fuzzy analytic hierarchy process (FAHP) to analyze the dynamic character of stakeholder networks. For this, three measurement points have been used: demolition, construction, and use phase.

Ego-centric vs whole-centric network analysis

As mentioned earlier, two types of networks can be analyzed in SNA: ego-centric and whole-centric networks (Hatala & Lutta, 2009). Only one paper analyzed an ego-centric network, in which they specifically focused on the direct relationship between the owner, contractor, and subcontractors (Jafari et al., 2020). The rest of all the other reviewed papers used a whole-centric network perspective. That the majority of the papers analyzed the whole-centric instead of ego-centric is logical, since executing a construction project requires the collaboration of different parties. As a result, to gain a complete understanding of the stakeholder network, one needs to take a whole-centric perspective in which all the stakeholders within a certain boundary are analyzed. For the network boundary, two types of studies can be identified: studies that only take into account internal stakeholders and studies that take into account both internal and external stakeholders. The majority (15 out of 25) of the studies also included external stakeholders within their network boundary. In all of these 15 papers, they included the relevant public authority. Another often included type of external stakeholder is the surrounding community (9 studies). Whereas some papers (6 papers) also included NGOs, in which the paper of Lin et al. (2024) specifically mentioned an environmental NGO (ENGO). The other mentioned external stakeholders are the media (4 papers), future users (3 papers), and local businesses (2 papers). This list of external stakeholders aligns with the earlier presented insights of Ward & Chapman (2008), which considered the local government, local communities, regulatory agencies, environmental groups, the media, and future users all to be external stakeholders.

Contextual factors in SNA studies

Type of construction project

The examined SNA studies in the literature review have analyzed a number of different types of construction projects; see Figure 11. On the basis of this overview, the conclusion can be drawn that a large part of the SNA studies have analyzed infrastructure (e.g., road, rail, etc.) projects. This is followed by urban redevelopment and energy production projects. Furthermore, two articles examined PPPs, while one considered public and private projects in addition to PPPs. In one paper they used multiple megaprojects as input, consisting of three types of projects: infrastructure, energy production, and logistics center (X. Xia & Xiang, 2023). Which stresses once again the current emphasis on civil projects in the literature. Moreover, in one article, instead of using a specific type of construction project, they used a typically large Design and Construct (D&C) project (Loosemore et al., 2020). Finally, it can be seen that these project types do not add up to the total number of 25 SNA studies reviewed in this chapter because two studies do not mention their project type.

Geographical location

In addition to differences in terms of the type of construction project, distinctions can also be made based on the geographical location of the study; see Figure 12. What can immediately be seen is that the majority of the studies have been conducted in China. While Australia is the only other country with more than one study. Moreover, it can be concluded that research in the European context is clearly lacking, with only one study in Norway and one in Italy. Additionally, it stands out that one paper used a global perspective by considering projects from multiple countries (C. Liu et al., 2022). Finally, it can be seen that also in this case the projects do not add up to the total number of 25 SNA studies reviewed in this chapter because three studies do not mention the location of the study.

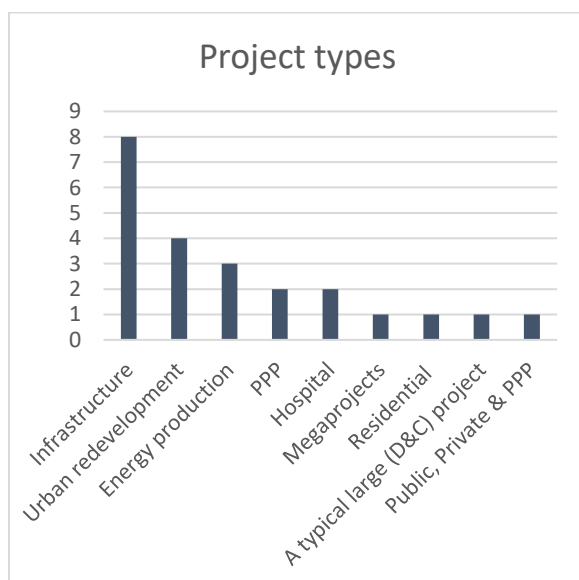


Figure 11: Project types

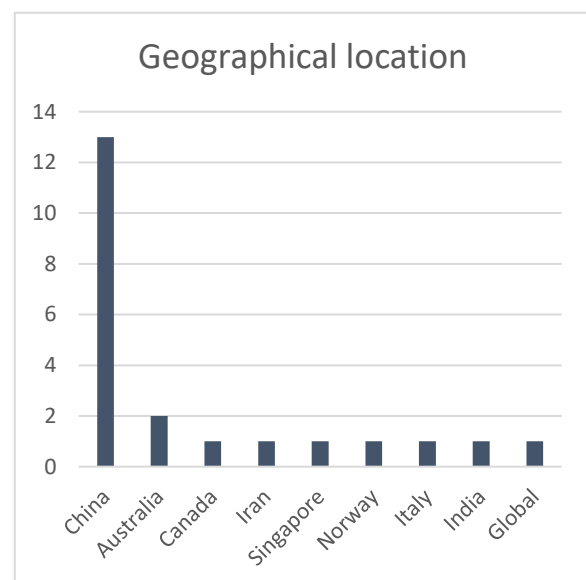


Figure 12: Geographical location

Used research approaches in SNA studies

Common research process

In the reviewed papers, it can be seen that stakeholder analysis and SNA are used as complementary methods. This is consistent with earlier claims in this study that these two methodologies complement each other. Two types of research processes have been used. In type 1, stakeholders are classified by means of a stakeholder typology model prior to conducting the SNA; see Figure 13. The strength of this process is that additional information can be coupled to the stakeholder network. For instance, Zhuang et al. (2019) linked the factors of interest and knowledge level to the network structure.



Figure 13: Research process type 1

Whereas in type 2, which the majority of the papers adopt, a set of mathematical metrics of SNA are used for the classification of the stakeholders, see Figure 14. The strength of this process is that for the stakeholder classification, the wider network of which the stakeholder is part of is taken into account. In dynamic studies, these two research processes are used for each of the selected phases of the construction project of study.

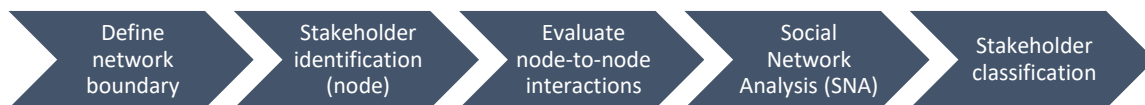


Figure 14: Research process type 2

Weighted vs unweighted networks

In terms of research methodology, a division can be made between weighted and unweighted networks. The majority (14 out of 25) of the research studies considered in this literature review utilized unweighted networks. In unweighted networks, the links between the nodes are either present or absent (Xue et al., 2023). In contrast, in weighted networks a weighting is assigned to a link between nodes, representing the strength of the connection. This information adds depth to the analysis (Jafari et al., 2020).

Granovetter's (1973) theory of strong and weak ties is applicable to both weighted and unweighted networks. According to this theory, relationships can be classified with respect to the strength of the connection based on four parameters: interaction frequency, emotional depth, closeness, and degree of reciprocity. Strong ties may offer reliable and trustworthy resources and are helpful for building trust structures. Weak ties, on the other hand, are helpful for getting additional, varied, and heterogeneous knowledge and information. In construction projects, the majority of the stakeholders have weak ties because they are usually working together for the first time and therefore do not have enough time to build a trusting relationship (G. Wu et al., 2020).

In the reviewed papers, three methods for determining the weights in weighted networks have been identified:

1. **Frequency of communication:** Jafari et al. (2020) determined the relational weights based on how often stakeholders communicate with each other.
2. **Cooperative interactions:** Wang et al. (2020) determined the relational weights by counting the number of actions stakeholders engage in together.
3. **Multiple parameters:** Zheng et al. (2024) used three parameters to gauge the strength of a connection: the presence of a contractual agreement, reciprocal interests or subordinate connections, and direct communication possibilities. Designating a strength of five, three, or one to a link correspondingly. In the case none of the earlier listed relationships are present a weighting of zero is assigned.

Directed vs undirected networks

Another division that can be made in terms of research methodology is the usage of directed or undirected networks, wherein a small majority of the studies applied directed networks (14 vs. 11). In undirected networks, links indicate a two-way interaction between two actors. In directed networks, on the other hand, links indicate an interaction flow with a specific orientation, for instance, from person A to person B or vice versa (Herrera et al., 2020). This makes directed networks especially suitable for representing information flows (e.g., Jafari et al., 2020; Badi et al., 2022).

Levels of analysis and corresponding metrics

As earlier discussed, social networks can be analyzed by means of node- and network-level metrics. It can be concluded that the majority of the reviewed research studies analyzed the social networks on a node as well as network-level. In contrast, Chen et al. (2024) made the distinction between the micro-, meso-, and macro-levels.

- The micro-level focuses on measuring the significance of individual stakeholders, which provides insights into the specific roles of each individual stakeholder. For this purpose, node-level metrics can be employed. However, its scope is limited by neglecting the overall network structure of which these individual stakeholders are part (Chen et al., 2024).
- The meso-level is concerned with examining local network structures, focusing on identifying the presence of subgroups or clusters within the network. Network-level metrics can be used for this purpose. The general limitation of this level is that it does not capture how these clusters fit in the overall network (Chen et al., 2024).
- At the macro level, the overall network structure is analyzed using network-level metrics. This provides a comprehensive understanding of how the stakeholder network is structured. However, details about the individual roles or importance of specific stakeholders at this level of analysis are often lacking (Chen et al., 2024).

Overall, the conclusion can be drawn that each level of analysis has its own strengths and weaknesses. Therefore, to gain a comprehensive understanding, a combination of the three levels is needed. This ensures that the conducted analysis captures insights at the individual stakeholder level (micro), reveals the presence of subgroups or communities (meso), and creates an understanding of the overall network structure it's part of (macro). By integrating all three levels, a more concise and complete analysis of stakeholder networks is achieved. However, the literature review revealed that not all levels of analysis receive equal attention; see Table 4.

Table 4: Overview application level of analysis

Level of Analysis	Static	Dynamic	Total	Percentage
Micro-level	11 times	12 times	23/25 studies	92%
Meso-level	5 times	2 times	7/25 studies	28%
Macro-level	7 times	9 times	16/25 studies	64%

This overview of the current literature shows a strong emphasis on the micro-level, which is analyzed in 92% of the considered studies. This shows a focus on stakeholders at the individual level. Furthermore, the majority (64%) of the current studies analyzed the macro-level. Which shows that also the overall network structure, of which these individual stakeholders are part, is taken into account in most of the current studies. In contrast, only a small proportion (28%) of the current studies considered the meso-level. Indicating a lack of research on this level. Additionally, it was noted that in most of the studies, different levels of analysis are combined; see Table 5.

Table 5: Overview of analysis level combination

Analysis Level Combination	Static	Dynamic	Total	Percentage
Micro only	3 times	4 times	7/25 studies	28%
Micro & Meso	2 times	0 times	2 studies	8%
Micro & Macro	4 times	7 times	11/25 studies	44%
Meso & Macro	2 times	1 times	3/25 studies	12%
Micro, Meso & Macro	2 times	2 times	4/25 studies	16%

This overview of the combined level analysis shows that the micro- and macro-levels are the most frequently combined (44%). Moreover, it can be seen that the combination of the meso-level with either the micro- or macro-level is less common. This also holds for the combination of all three levels together, despite the earlier mentioned importance of integration to get a comprehensive understanding of the stakeholder network. These findings indicate a gap in the literature, suggesting the need for additional research that combines all three levels.

Mico-level (Node-level metrics)

The most commonly applied node-level metrics are the three centrality indicators: degree centrality, betweenness centrality, and closeness centrality (e.g., Uddin et al., 2023; Wang et al., 2021). In addition to the separate indicators, a centrality index can be computed by taking the average of these three centrality indicators (Dogan et al., 2015). Each of these metrics has its own purpose, strengths, and weaknesses, which are presented in Table 6.

Table 6: overview micro-level metrics

Metric	Purpose	Strengths	Weaknesses
Degree centrality	Assesses a node's degree of connectedness ¹	<ul style="list-style-type: none"> Shows stakeholders impacts on decision-making and access to information² 	<ul style="list-style-type: none"> Does not take into account the strength of the neighboring nodes³ Neglects reach within the network²
Betweenness centrality	Calculates a node's relative position to other nodes ¹	<ul style="list-style-type: none"> Identifies "middlemen" who creates quick channels of communication⁴ Indicates degree of influence² 	<ul style="list-style-type: none"> Assumes the information flow always passes through this "middleman"¹
Closeness centrality	Calculates a node's average distance to every other node in order to assess proximity ⁵	<ul style="list-style-type: none"> Reflects the ease of communication and dependency on others⁵ 	<ul style="list-style-type: none"> Assumes proximity is always directly related to information access⁶
Centrality index	Combines the separate three indicators ⁷	<ul style="list-style-type: none"> Can be used for a stakeholder prioritization⁸ 	<ul style="list-style-type: none"> The assumption of equal importance of the three indicators⁸

1: (Hewa Welege et al., 2021); 2: (Zhuang et al., 2019); 3: (Segarra & Ribeiro, 2016); 4: (Otte & Rousseau, 2002); 5: (Chen et al., 2024); 6: (Lin & Wu, 2021); 7: (Dogan et al., 2015); 8: (Yu et al., 2017).

The mentioned weaknesses of degree centrality can be addressed by combining insights from other metrics. Specifically, its limitation in neglecting the strength of the connected neighbors can be addressed by using eigenvector centrality, which takes into account this notion (Segarra & Ribeiro, 2016). Additionally, degree centrality's lack of consideration for the reach of the node within the network can be addressed through closeness centrality (Zhuang et al., 2019).

Meso-level (network-level metrics)

To identify the formation of sub-groups or communities, the majority of the scholars have applied the clustering coefficient. Furthermore, the metric of modularity (Lin & Wu, 2021) has been applied for subgroup detection. Whereas some scholars also examined the presence of a core-periphery structure. According to Liu et al. (2022), clusters can also be identified by means of triads. Each of these metrics has its own purpose, strengths, and weaknesses, which are presented in Table 7.

Table 7: Overview meso-level metrics

Metric	Purpose	Strengths	Weaknesses
Clustering Coefficient	Measures the tendency of nodes to form clusters ¹	<ul style="list-style-type: none"> Identifies local groupings of stakeholders¹ 	<ul style="list-style-type: none"> Doesn't capture insights outside the local clusters
Modularity	Quantifies how well a network is divided into communities or groups ²	<ul style="list-style-type: none"> Indicates subgroup formation² Considers the connections between different subgroups² 	<ul style="list-style-type: none"> Uses a range which makes it a subjective interpretation of the findings²
Core-Periphery Structure	Divides a network in a periphery and core ¹	<ul style="list-style-type: none"> Helpful for identifying the central nodes and hierarchical structure¹ 	<ul style="list-style-type: none"> May undervalue peripheral nodes with crucial roles (e.g., municipality)
Triads	Analyzing the composition of three-nodes ³	<ul style="list-style-type: none"> Reveals local subnetworks 	<ul style="list-style-type: none"> Limited scope only focusses on three node structures

1: (Chen et al., 2024); 2: (Lin & Wu, 2021); 3: (Park et al., 2011).

Macro-level (network-level metrics)

The most popular network-level metric at the macro-level is density, which is in most studies applied in combination with the three centrality metrics (e.g., Badi et al., 2022). These three centrality metrics can also be extended into the network-level metrics of degree-, closeness-, and betweenness centralization (Uddin et al., 2023). Following the popularity of the centrality metrics, in eight papers also the average degree of the overall network has been computed (e.g., Wang et al., 2020). The metric diameter, which looks at the network size, is also an often employed metric (e.g., Alhassan, 2024). Related to this metric is the Average Path Length (APL) (Gao et al., 2020). Each of these metrics has its own purpose, strengths, and weaknesses, which are presented in Table 8.

Table 8: Overview macro-level metrics

Metric	Purpose	Strengths	Weaknesses
Density	Measures the overall network connectivity ¹	<ul style="list-style-type: none"> Indicates the level of collaboration² 	<ul style="list-style-type: none"> Neglects the strength of the connections
Centralization (degree, closeness, betweenness)	Measures the extent to which the network is centered around central nodes ³	<ul style="list-style-type: none"> Shows the influence of core nodes in the wider network³ 	<ul style="list-style-type: none"> May overemphasize the importance of these central nodes
Average degree	Counts the average number of connections per node ¹	<ul style="list-style-type: none"> Useful for identifying the general level of connectivity 	<ul style="list-style-type: none"> Neglects the strength of the connections May be biased by a few highly connected nodes
Diameter	Computes the longest path among all shortest paths ¹	<ul style="list-style-type: none"> Captures the network size 	<ul style="list-style-type: none"> Sensitive to outliers
Average Path Length	Measures the average distance between nodes ⁴	<ul style="list-style-type: none"> Displays how easy stakeholder can reach each other² 	<ul style="list-style-type: none"> Can be biased by outlier distances

1: (Chen et al., 2024); 2: (Jafari et al., 2020); 3: (Uddin et al., 2023); 4: (Gao et al., 2020).

Key findings from the literature

When analyzing the reviewed papers, a number of consistent and contradictory findings can be identified. First of all, a common observation in the literature is the dynamic character of stakeholder networks. Wang et al. (2022) and Lin et al. (2024) both mention that stakeholders are constantly joining and leaving the network at different points in time. Dadpour et al. (2019) also endorse that the total number of involved stakeholders changes throughout the project. However, they state that this happens occasionally and not constantly, as in the papers of Wang et al. (2022) and Lin et al. (2024). Furthermore, their findings indicated that the concerns of the stakeholders also fluctuated during the project. In addition, Lin et al. (2024) state that also the stakeholder relationships are consequently changing, and thus the metrics as well. Chen et al. (2024) argued that interactions between information demand and flow lead to the need for collaboration, which causes the formation of these relationships.

Secondly, various papers provided findings on the evolution of density throughout the project. Both the papers of Wang et al. (2022) and Zheng et al. (2024) reported a U-shaped evolution of the network density, with the highest density level in the decision-making/preparation phase, a decline throughout the construction phase, and an increase once again in the maintenance and operation phase. Li et al., (2021) endorses the finding that density decreases within the construction phase. Tang et al. (2020) confirmed this U-shaped trend and added that along with the decrease of the network density, the average distance is increasing. However, in contrast with earlier stated findings, Tang et al. (2020) found that instead of the decision-making/preparation, the density is the highest in the maintenance and operation phase. Wang et al. (2023) argued that the network density is higher during the construction, operation, and transmission phases in comparison with earlier stages, which contradict the U-shaped evolution reported by others. Wang et al. (2020) further contradicts this U-shaped evolution by describing another evolutionary pattern, in which network density increases until the tender period, after which it decreases.

Besides the evolution of density levels during the project, several studies indicate that the key stakeholders vary across project stages. This claim is, for instance, endorsed by Tang et al. (2020), who argued that the client and government agencies are the primary stakeholders in the design preparation phase. As the project moves forward into the construction, the owner and the contractor are considered the primary stakeholders. Ultimately, the owners and the community around the project will become more important when it moves into the operation stage. Xue et al. (2023) also argue that the client possesses a central position in the design preparation stage. Whereas in the paper by W. Wu et al. (2020), they also came to the conclusion that the government is a key player in this stage. Nevertheless, they claim that urban planning and design agencies and academics play a key role during this phase. Zheng et al. (2024) also acknowledge the central position of the government in the preparation stage. However, they also state that consulting firms and construction companies are the main players in this stage. This paper also mentions the demolition phase, in which construction companies, the public, and land acquisition parties are the main players.

In addition, several papers endorse the claim that the contractor is a primary stakeholder in the construction stage (Dadpour et al., 2019; H. Xue et al., 2023; Zheng et al., 2024). Alongside the contractor, other construction companies and consulting firms are also considered key players in this phase. Whereas in the maintenance and operation stage, the key players are the public and property management organizations (Zheng et al., 2024). This is in line with earlier claims by Tang et al. (2020) of the importance of the public in this stage of the project. On the other hand, Wang et al. (2019) contradict this and claim that local residents are the least centrally located throughout the project. Whereas Zheng et al. (2024) state this is the media.

While the majority of the studies highlight the shifting influence of stakeholders, others emphasize the consistent importance of certain actors. Wang et al. (2020) claim that the architect and the civil and structural engineer remain primary stakeholders throughout the project. Xia and Xiang (2023) observed that the local government is a crucial stakeholder at each stage. A similar conclusion was drawn by Wang et al. (2021). However, this contradicts the findings of Lin et al. (2024) and Wang et al. (2022), who stated that the central role of the government no longer applies during the construction phase. Both of these papers argue that the developer possesses a central position within this phase. Furthermore, Wang et al. (2022) noted that along with the developer, local inhabitants are the most powerful. Which not only applies in the construction phase but also in the operation and maintenance phases of the project. Moreover, Badi et al. (2022) argue that the project manager plays a central role throughout the whole project. This claim is endorsed by Loosemore et al. (2020), who observed that the project manager remains important throughout the project. However, they noted that the project manager, along with owner, only holds the most central position in the project scope/feasibility stage. In the tender phase, the bid manager replaces the project manager in the major coordinating function. Whereas the design manager takes the leading role in the design and planning stage. In the final construction, there is another shift in leadership, in which the construction manager takes the key role. That the project manager does hold the most central role in each stage is further endorsed by Li et al. (2021), who further claim that throughout the building phase, engineers have a higher betweenness centrality than project managers do. Wang et al. (2023) specifically studied PPPs in which the public authority, public initiator, and private consortium can be denoted as the most powerful stakeholders. Despite the fact that a stakeholder can be a central node within a network, no single stakeholder can have total control over the network (Y. Wang et al., 2020; W. Wu et al., 2020).

According to the literature, stakeholder networks are divided into several subgroups based on their role within the network (Lin & Wu, 2021; Wang et al., 2019; Xue et al., 2023). This applies, for example, to the general contractor, subcontractor, and material suppliers, which are all related to the construction process (Xue et al. 2023). Moreover, Zheng et al. (2024) argue that the primary stakeholders group together in small cliques. Lin and Wu (2021) also stress the importance of brokers, who connect the different subgroups with each other. They state that information sharing and cooperation are more susceptible in a network with fewer brokers.

This is due to the fact that if the brokers are unavailable, a small part of the network would lose its links to other groups. Liu et al. (2022) endorse the great influence of hubs within the network.

Next to the subgroups, a network can also be segmented into a core and a peripheral layer (Alhassan, 2024; H. Xue et al., 2023). This shows the presence of a hierarchical structure (Alhassan, 2024), in which directives are given from central to peripheral stakeholders. (Xue et al. 2023). Zhuang et al. (2019) provided a contrasting view, presenting that despite the importance of the municipality in the decision-making process, they possess a peripheral position in the network. Contradicting that the important stakeholders are always present at the core of the network. Uddin et al. (2023) further expand on this by comparing the network-level metrics of public, private, and PPPs. They concluded that there is a statistically significant difference ($p < 0.05$) between the three project types' network-level metrics of betweenness centralization, edge number, density, and network size. Moreover, compared to the other two types of networks, PPP networks often have a single central node combined with a more star-shaped network layout. This emphasizes the importance of the project context, such as project type on the network structure.

Another observation in the reviewed papers is the presence of a relationship between different metrics. For instance, actors with high degree centrality are often likely to demonstrate high betweenness and closeness centrality (Halder, 2024). However, Corazza et al. (2024) identified that the prioritization stakeholders obtained through the centrality degrees significantly differ from what the managers declare in reference to the concept of salience. Furthermore, high network density goes together with a longer shorter average distance between nodes, while lower density is associated with longer average distance (Zheng et al., 2024).

Strengths and weaknesses of previous studies

On the basis of this systematic literature review, the conclusion can be drawn that the current state-of-the-art literature has its strengths and weaknesses. Beginning with the strengths. First of all, is there a clear framework available for how SNA can be utilized for the stakeholder management of construction projects. Moreover, since SNA have already been used multiple times in the context of stakeholder management, there is already a well-developed set of research findings available. Furthermore, is there a clear set of mathematical metrics available for the analysis on micro-, meso-, and macro-level. This all aids in gaining a comprehensive understanding of the stakeholders networks of construction projects and can be used as a basis for this study.

In terms of weaknesses, the first important weakness is the lack of papers on the dynamic character of stakeholders, since the majority of the conducted studies adopt a static approach. As a result, insights into the evolution of network structures are still limited. Furthermore, the majority of the research has been conducted in China, thus lacking insights from the European construction industry. In the Dutch construction industry, not even one construction-based SNA study has been conducted in the last five years. Additionally, the type of projects studied were primarily infrastructure (civil) projects, resulting in little insight into other types of construction projects. Moreover, there is a lack of (longitudinal) studies that consider all three levels of analysis (micro-, meso-, and macro-level) despite the importance of integration to get a comprehensive understanding of the stakeholder network. Finally, procurement approaches to the project were considered in only two studies, despite their impact on the network structure. The studied procurement approaches were (1) Design-and-Construct (D&C) and (2) engineering, procurement, construction (EPC). Next to this, no comparison between different procurement methods has been made before. Overall, there is a notable lack of comparative studies, as almost every study uses only one project as a case study.

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3. Methodology

3.1 Introduction

At the start of this study, it was identified that there is currently a lack of longitudinal studies that compare the evolution of stakeholder networks between different procurement approaches, despite evidence that the social network structures differ between various procurement types (Hughes et al., 2015). This study aims to fill this research gap by conducting a comparative analysis of collaboration networks across different procurement approaches. To this end, a number of research questions were established:

- RQ 1: How do stakeholder network structures of different procurement approaches evolve during the life cycle of a construction project using SNA?
- RQ 2: How does the evolution of stakeholder network structures of different procurement approaches compare?
- RQ 3: What are the factors that drive the changes in the network structure?
- RQ 4: How can the insights from the SNA be applied to enhance stakeholder management in construction projects?

These research questions will be addressed by utilizing a mixed-methods approach, including analysis of project documentation, semi-structured interviews, case studies, and Social Network Analysis (SNA). The combination of these methods was chosen because it allows for a comprehensive understanding of stakeholder networks and management from a theoretical as well as practical perspective. This section discusses the chosen research methods one by one and justifies the selection.

Analysis of project documentation: Document analysis comprises a methodical process for examining and assessing documents by identifying, selecting, analyzing, and combining the information they contain (Kutsyuruba, 2023). The project documentation (e.g., stakeholder management plan), which contains information about the involved stakeholder and communication structure, will be analyzed. These insights will contribute to answering the first and second research questions.

Semi-structured interviews: In semi-structured interviews, a combination of closed-ended and open-ended questions, frequently coupled with how and why questions, are asked of each responder individually. For this procedure, a maximum duration of around one hour is deemed appropriate (Adams, 2015). This method will be used to gather in-depth insights into stakeholder networks, which will complement those obtained from the project documentation. The combination of insights from both methods ensures accurate network structures, which form the basis for answering the first and second research questions. Moreover, will the method of semi-structured interviews be employed for capturing in-depth insights into the drivers behind network dynamics from a practitioner's view. These insights can be used for answering the third research question.

Case studies: A case study is an in-depth analysis of a single unit with the goal of drawing generalizations to a broader group of units (Gerring, 2004). This method forms an essential basis of this study and can be related to all of the four research questions, as the case studies will provide the necessary real-world project data. This project data will be captured via the earlier mentioned document analysis and interviews.

Social Network Analysis (SNA): SNA is a quantitative research method that analyzes the configuration of connections between different network nodes in a social network. For this purpose, SNA applies a variety of mathematical metrics to specify the attributes of individual network nodes as well as the network as a whole (Borgatti et al., 2013). In this study, SNA will be used to analyze the network structure of the case studies at different measurement points. This analysis allows for an understanding of how the network structures evolve over time. Gathering these insights is a critical part of my research and can be used for answering the first and second research questions.

Strength and weaknesses of chosen approach

The chosen methods in this approach also have their own strengths and weaknesses. Beginning with the analysis of project documentation, this method's strength is its efficiency, which comes from its ability to gather data fast. Nevertheless, this method's weakness is that the collected data lacks sufficient detail. As a consequence, this approach is frequently combined with other qualitative research techniques (Bowen, 2009). This approach will also be used in this thesis by combining the insights of the document analysis and the semi-structured interviews. The strength of semi-structured interviews is that they offer the flexibility of being able to ask follow-up questions. Whereas in questionnaires, which can be considered the alternative to conducting interviews, this flexibility is absent. However, the weakness of this method is that semi-structured interviews are time-intensive as they require substantial preparation of the interviewer. This process includes getting familiar with the topic and designing the interview questions (Adams, 2015). As the previously conducted systematic literature review identified the state-of-the-art knowledge on this topic, a part of its weakness is already addressed.

The next applied method is the case study, which plays a fundamental role in this study. This method's strengths include the ability to analyze a real-world project in great detail, the generalizability of the findings, and the ability to address topics that were previously limited known about. Furthermore, when properly constructed, a case study enables one to demonstrate intermediary causes that exist between a cause and its alleged effect. A single case study's representativeness is a weakness of this method since the findings could not be applicable to other projects (Gerring, 2004). This weakness cannot be addressed in this study due to time constraints. Therefore, will this weakness be considered a limitation of this study. Despite this, the selection of the case studies is an important issue in this thesis to increase the relevance of the findings. This will be further discussed in section 3.3. Finally, the strength of SNA is that it provides an interconnected, contextual, and comprehensive view of project organizations (Borgatti & Foster, 2003).

Moreover, by using a series of static networks, SNA is also able to capture the stakeholder dynamics (Ho et al., 2020). In addition, SNA also offers a way to simplify the visualization of complex social networks (Presenza & Cipollina, 2010). However, this simplification process includes the removal of context and substance, which may simplify reality (Crossley, 2021). Furthermore, it is challenging to get all of the network data (van der Hulst, 2009). But lacking data significantly affects social network analysis and social structure (Coles, 2001). Lastly, collecting, coding, and evaluating the data takes a substantial amount of time (van der Hulst, 2009). The first weakness of this method will be addressed by looking at the drivers behind the changes of the network structure, which will be elaborated on in the third research question. The weakness in regards to the data availability will be addressed by combining the insights from the document analysis and semi-structured interviews. This decreases the chance of missing data. But this, of course, remains a potential issue in this study.

Tried and tested method

The employed methodologies can be considered “tried and tested”, since they have been previously applied in construction-based SNA studies. First of all, interviews and document analysis as data collection methods are widely used in construction-based SNA studies, as evidenced by the literature (Hewa Welege et al., 2021). Thus making it a proven method in this context. Also, the combination of analyzing project documentation followed by conducting interviews has been previously used (Chen et al., 2024; Gao et al., 2020). Showing also the proved strength of combining these two methods. Secondly, the use of case studies as a method has also been used numerous times in both static (Alhassan, 2024) as well as longitudinal studies (e.g., Zheng et al., 2024). Finally, SNA as a method can also be considered “tried and tested”, as it originates from the early 1930s (Moreno, 1934) and was introduced into CPM research in the 1990s (Chinowsky & Taylor, 2012). As a result, SNA has a clear theoretical framework that consists of a well-established set of mathematical metrics (Borgatti et al., 2013). In addition, the systematic literature review showed that SNA has previously been employed in the context of stakeholder management in static as well as longitudinal studies. In conclusion, high reliance could be placed on the results.

Summary

In conclusion, this research employs a mixed-methods approach, including analysis of project documentation, semi-structured interviews, case studies, and Social Network Analysis (SNA) to address the identified research gap. This research approach integrates qualitative (e.g., interviews) and quantitative (e.g., SNA) methods, which allows for a comprehensive understanding of the evolution of the stakeholder networks of different procurement approaches and thereby contributes to the identified research gap. One of the key challenges of this study is data completeness, since incomplete network data will have major consequences for my research findings. By combining insights from both project documentation and the semi-structured interview, this study aims to tackle this key challenge. The second key challenge is the generalizability of the research findings, which will be increased as much as possible within the scope of this research by a careful selection of the case studies (see section 3.3).

3.2 Research method

This study will utilize research process type 2 (see page 39), meaning that no stakeholder typology models will be employed prior to conducting the SNA. This decision is based on the recognition that traditional stakeholder typologies, when making a classification, neglect the broader network of which these stakeholders are a part. This is considered inadequate as the mutual relationships between stakeholders are crucial in complex project environments (K. Y. Mok et al., 2015; J. Yang et al., 2011). Additionally, as discussed in Section 2.4.2, these relationships also change over time. Consequently, these stakeholder typology models are not able to fully capture the stakeholder dynamics, which is a crucial component of this study. However, it is important to note that the limitation of choosing this process is that no additional layers of information (e.g., concerns) can be incorporated into the network, as SNA cannot capture this solely through their metrics.

To further investigate stakeholder dynamics, this study will employ the case study research cycle. This approach allows for an in-depth analysis of a single unit with the goal of drawing generalizations to a broader group of units. Moreover, does this research method possess the ability to address topics about which little was previously known (Gerring, 2004). The combination of strengths of this method is well suited to enhance our understanding of the evolution of stakeholder networks, about which little is known, and to increase the generalizability of the findings. The case study research cycle follows an iterative sequence of steps, which includes the following: research question(s) formulation, case selection, preparation for data collection, data collection, data analysis, shaping hypotheses, literature enfoldment, and closing (see Figure 15) (Eisenhardt, 1989).

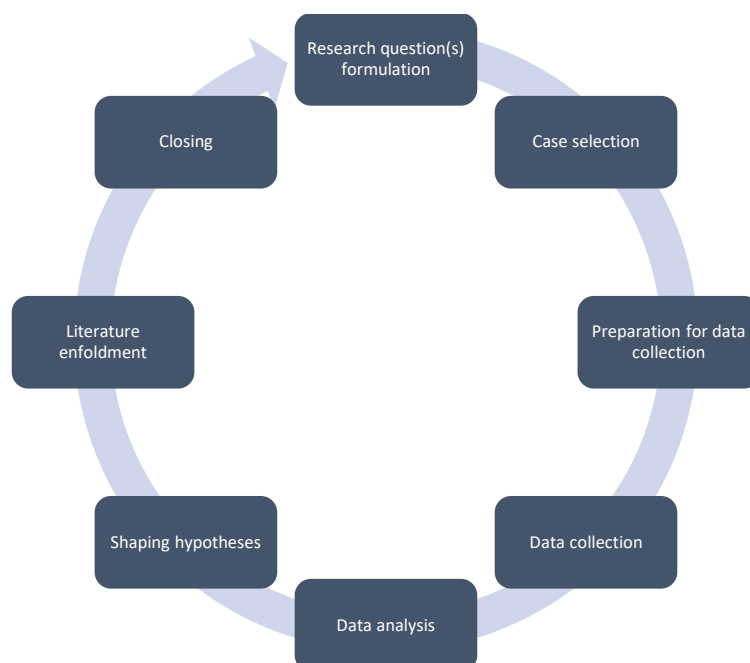


Figure 15: Case study research cycle (Eisenhardt, 1989)

Step 1 – Research question(s) formulation

The first step of the cycle involves a preliminary formulation of the research question(s), which should be stated in at least general terms. Because it is simple to become overwhelmed by the amount of data when there is no clear research focus (Eisenhardt, 1989). The research questions this study seeks to answer through the use of case studies were presented earlier in Section 3.1.

Step 2 – Case selection

The second step in the cycle involves the selection of cases, which is seen as a crucial component of developing theory from case studies. The notion of a population is essential to this selection process as it establishes the group of entities that the study sample will be taken from (Eisenhardt, 1989). In this study, cases do not refer to the population but to specific types of construction projects. However, this concept is still relevant because it determines the type of construction projects of the research sample. In addition, choosing an appropriate population helps determine the limits of variation within the study and the generalizability of the results (Eisenhardt, 1989). To facilitate this process, a set of selection criteria will be established.

Step 3 – Preparation for data collection

The third step involves the preparation for data collection by determining the data collection methods and procedures (Eisenhardt, 1989). In this study, project documentation and semi-structured interviews will be employed as data collection methods (see section 3.1). But SNA also requires some preliminary steps before it can be applied effectively. This includes the definition of the network boundary, SNA metrics, measurement points, and types of relationships being studied (Badi et al., 2022; Huang et al., 2023).

Step 4 – Data collection

Following the preparatory steps of this study, data will be collected by means of the earlier mentioned analysis of project documentation and conducting semi-structured interviews. These methods will be employed to collect the two types of crucial information when conducting a longitudinal Social Network Analysis (SNA) study: identification of stakeholders (nodes) and identification of relationships between stakeholders (links) at each defined stage (Badi et al., 2022). This information is integrated into a separate adjacency matrix of each step to analyze the data collected in the next step (Xue et al., 2023).

Step 5 – Data analysis

In this step, the collected data will be analyzed by means of SNA. Social Network Analysis consists of two components: the visualization of the network and examination of the network properties (Huang et al., 2023). This analysis will be conducted by means of NetDraw version 2.190 and UNICET version 6.800. Of which NetDraw will be used for the visualization of the networks and UNICET for the analysis of the network properties based on the selected SNA metrics in step 3. The combination of these two methods has been chosen since NetDraw is integrated within the UNICET software (Borgatti et al., 2002), allowing for an efficient workflow in visualizing and analyzing the network structures. To capture stakeholder dynamics, a number of static networks at each of the selected measurement points will be created (Ho et al., 2020).

Step 6 – Shaping hypotheses

After the case studies are analyzed separately, they will be compared to identify consistent and contradictory relationships between the variables studied in this thesis and the development of these variables over time. An important follow-up step is understanding the fundamental causes of these relationships, as this increases the internal validity (Eisenhardt, 1989). Specifically in this study, this can be seen as the key drivers behind the identified network changes (e.g., the key players changes over time).

Step 7 – Literature enfoldment

The seventh step of this research cycle involves the comparison of findings with the current literature to identify contradictions and similarities. While the comparison with similar literature improves the generalizability, comparison with contradictory literature increases the internal validity (Eisenhardt, 1989). This comparison will be made on the findings of the previously discussed systematic literature review (see Chapter 2), which covers the results of previously conducted research.

Step 8 - Closing

The final step of this research cycle involves reaching theoretical saturation (Eisenhardt, 1989). Theoretical saturation denotes the moment in time when there is little incremental learning since the researchers are seeing previously observed events (Glaser & Strauss, 1967). In reality, practical factors like time and cost frequently interact with theoretical saturation to determine when case collection concludes. As a matter of fact, researchers frequently plan the amount of case studies upfront (Eisenhardt, 1989). To make sure that the execution of the case study research cycle fits within the scope of this thesis (6 months), the number of case studies will be selected in advance. This selection will be made in step 2: case selection. Finally, insights captured in the SNA will be translated into practical lessons on how the stakeholder management of construction projects can be enhanced throughout the project life cycle.

The described eight steps of the case study research cycle lead to the following flowchart; see Figure 16.

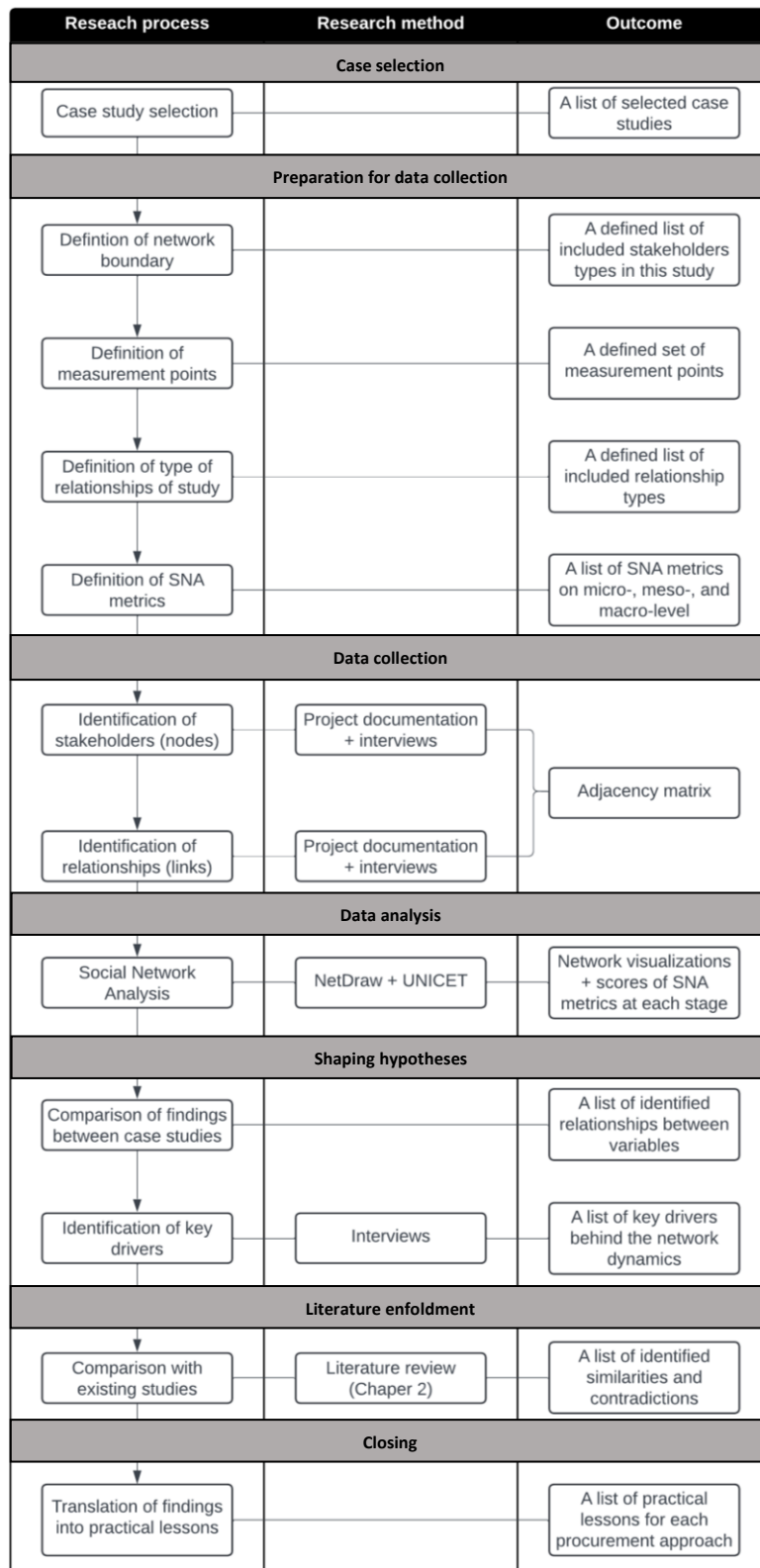


Figure 16: Flowchart methodology

3.3 Case selection

3.3.1 Selection criteria

For the selection of appropriate case studies, a number of selection criteria were established; these are the following:

Criteria 1 - Project manager: The project manager of the selected case studies still needs to work at Brink to be able to interview them. This is important for creating accurate stakeholder networks and capturing the factors that drive the changes of the network structure.

Criteria 2 – Involvement in multiple stages: As this study will assess the stakeholder dynamics of the selected case studies, a number of static networks need to be created. Therefore, involvement of the project manager of Brink in multiple stages is needed to be able to capture the necessary information.

Criteria 3 - Availability of project documentation: Project documentation needs to be available to create accurate network structures. The availability of a stakeholder management or project management plan is the most important, as it shows which parties are involved and how they are related to each other. This information is important because the more information that can be obtained in advance, the more specific the questions that can be asked during the interviews.

Criteria 4 - Complexity: SNA is particularly useful in the context of complex stakeholder networks consisting of a large number of stakeholders. Since the relationships and dynamics within these complex stakeholder networks are particularly difficult to capture with traditional stakeholder analysis methods. To exploit the potential of SNA, selected case studies should consist of at least 15 stakeholders.

Criteria 5 - Core similarities: The selected case studies should have core similarities to ensure the generalizability of the research findings. The project must be similar in terms of followed project phases to allow for consistent comparison. Additionally, all case studies must either be public or private, as the stakeholder networks significantly differ between these two types (Uddin et al., 2023). Additionally, the case studies should be similar in terms of project size, which will be expressed in this study as the number of involved stakeholders, since this heavily influences the executed SNA later in this study. To ensure this similarity, each case study should have at least 15 stakeholders. Moreover, the same core stakeholders should be present in all cases (see section 3.4), since large differences could reduce the validity of the comparison. By avoiding a fixed threshold (e.g., 50% similar stakeholders), this approach ensures that the project context is not neglected. Finally, since this study focuses on the Dutch context, all selected case studies must have been or are being conducted in the Netherlands.

Criteria 6 - Contextual differences: Despite the importance of consistent elements in the selected case studies, some contextual differences are also valuable, as this will provide useful insights. There will be sought for differences in terms of procurement approaches.

3.3.2. Potential case studies

In the first few weeks of this thesis, several project managers were spoken with, resulting in a list of projects that could potentially serve as case studies. An overview of these projects is shown in Table 9.

Table 9: Overview of potential case studies

No.	Project type	Public or Private	Greenfield or brownfield	Involved phases	Procurement approach	Complexity	Proj. Doc.
1	R&D building	Private	Greenfield	Definition → start execution	Bouwteam → D&B (UAC-IC)	> 20	PMP, SA & MS
2	Education	Public	Brownfield	Initiative → completion	E&C (UAC-IC)	> 15	POS, CP, PID
3	Office	Public	Brownfield	Initiative → completion	D&B (UAC-IC)	> 15	PMP & CP
4	Leisure	Public	Greenfield	Initiative → completion	DBB (UAC)	> 20	PMP, POS, CP
5	Residential (student)	Public	Greenfield	Design stage → completion	D&B (UAC-IC)	> 15	POS & CP
6	Mixed use building	Public	Brownfield	Design stage → completion	D&B (UAC-IC)	≈ 10	SA

PMP: project management plan, PID: project initiation document, SA: stakeholder analysis, MS: meeting structure, POS: project organization structure, and CP: communication plan

3.3.3. Selected case studies

In the process of selecting appropriate case studies for my thesis, two projects (projects 5 & 6) are immediately dropped because Brink was involved only from the design stage. Therefore, no information is available about the earlier initiative and definition phase, which limits the process of identifying stakeholder dynamics. Which leaves four projects to select from. The first project that will be selected is project 4, since this project is the only one that uses a Design-Bid-Build (DBB) as a procurement approach, which includes a traditional UAC contract. The other two projects that will be selected are projects 2 and 3, as they both have a different procurement approach than project 4 and use a different contract type (UAC-IC instead of UAC). Furthermore, in all these three projects, Brink was involved from the start (initiation), which increases the ability to capture the stakeholder dynamics. Finally, all three projects are public projects, which increases the internal validity of the findings. Since it was seen that the stakeholder networks significantly differ between public and private projects. That is also the reason why project 1 is not selected despite their different procurement approach than the other projects.

3.3.4. Further explanation of chosen procurement approaches

Over time, the definition of procurement in the construction industry has changed to take into account not only different processes and procedures that include finding the best supplier of the products being procured, negotiating contracts, and overseeing the purchasing processes, but also project delivery methods that align with the interests of project stakeholders (Jelodar et al., 2016; Ogunlana, 2003; Rahmani et al., 2017; G. M. Winch, 2009). Procurement management and project delivery methods are closely related in the construction industry. This is because each delivery method has an impact on how procurement is managed in construction projects by establishing the contractual obligations and organizational structure of each contracting party, including the roles and responsibilities of clients and contractors (Kim & Kim, 2024).

The construction sector offers various project delivery methods, with Design-Bid-Build (DBB) and Design & Build (D&B) approaches being the most popular (Hettiaarachchige et al., 2022; Idoro, 2012). This study will evaluate these two popular project delivery methods, along with Engineer & Construct (E&C). In DBB, the design and construction stages are clearly separated, as are the parties involved and the contracts used to carry them out. In contrast, D&B integrates both design and construction under a single contract, wherein one party is responsible for both stages (Idoro, 2012). Engineer & Construct is similar to D&B, but the contractor's design component is restricted to engineering (Van der Linden, n.d.). To govern these project delivery methods, two contract types are used in the Dutch construction industry: UAC and UAC-IC. DBB employs a UAC contract, whereas D&B and E&C utilize a UAC-IC as a contract type.

In the Netherlands, the most often used general terms and conditions for construction contracts are the Uniform Administrative Conditions for the Execution of Works and Technical Installation Works 2012 (also known as "UAC 2012"). The "traditional" legal relationship between a contractor and a client, also known as the "classic triangle" forms the basis of the UAC, as illustrated in Figure 17 (Chao-Duivis et al., 2018).

The UAC-IC 2005 (Uniform Administrative Conditions for Integrated Contracts 2005) represents an integrated contract model, meaning that one party has control over both design and execution with regard to the client. This party can be the contractor, but also the designer (the architect or consulting engineer) or another individual. An integrated contract does not always imply that the contractor assumes responsibility for design and/or execution, as shown in Figure 18. If the contractor lacks such knowledge, he will hire a construction contractor, architect, or consulting engineer (Chao-Duivis et al., 2018).

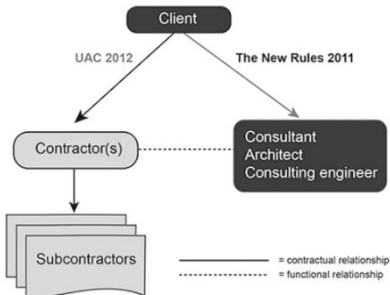


Figure 17: Schematic representation of the traditional contract (Chao-Duivis et al., 2018)

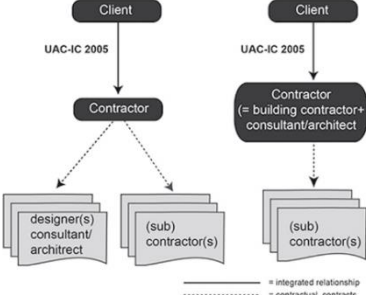


Figure 18: Schematic representation of the integrated contract (Chao-Duivis et al., 2018)

3.4. Definition of network boundary

The definition of the network boundary is a crucial first step before conducting a Social Network Analysis (SNA). This choice primarily addresses the issue of which stakeholders are part of the network being studied and which are not. The network boundary is often defined using one of two methods: "realist" or "nominalist" approach. In a "realist" approach, stakeholders themselves select who is included in the network. Whereas, in a "normalist" approach, the researcher sets the network boundary in advance depending on the goals of the study (D. Knoke & Yang, 2020). A "normalistic" approach will be used in this study because it provides control for me as a researcher as to which stakeholders are included and which are not. This also eliminates potential biases that may arise when stakeholders themselves select who is included in the network. Furthermore, since this study will compare different projects, this approach provides consistency in the stakeholders taken into account, which helps in the comparison process.

When defining the network boundary, a decision can be made to include either internal or external stakeholders, or both. The inclusion of internal stakeholders is logical since those are formally part of the project coalition (G. M. Winch, 2004) and are in charge of a project its management (N. Xia et al., 2017). External stakeholders, on the other hand, also have the ability to influence the project, even though they are not formally part of the project organization (Aaltonen, 2011; Walker et al., 2008). As a result, the effective stakeholder management of both internal and external stakeholders is crucial to the project outcomes. Therefore, both of them will be included within this study. In the case of internal stakeholders, a distinction is made between different departments or roles to reflect their specific contribution to the project. However, in the case of roles with overlapping functions in the projects, they are unified as one stakeholder. Furthermore, when internal stakeholders are a consortium of companies, for instance via a total engineering contract, these parties are considered as one stakeholder to reflect its single contractual relationship. In contrast, external stakeholders are treated as broader groups without subcategorization. Since these stakeholders, such as the competent authority, typically have a collective role within the project, despite consisting of different departments. By focusing on their role within the project rather than distinguishing between different departments, this study avoids unnecessarily complicating the network of stakeholders. To facilitate the analysis process, a numbering system was developed to classify stakeholders into the following three groups:

- C (Client-related stakeholders): These stakeholders are part of the client organization.
- P (Project-specific stakeholders): These stakeholders are specifically hired for the design/engineering and execution of the project.
- E (External stakeholders): These stakeholders are affected or influencing the project but are not part of the first two categories.

As mentioned earlier in section 3.3.1, this study uses a defined set of core stakeholders that must be present in all case studies. According to the literature and based on this numbering system, this study identifies the following core stakeholders (see Table 10).

Table 10: Core stakeholders

Stakeholder type	Description
Client-related	Client ¹
Client-related	Internal client departments ¹
Project-specific	Project manager ¹
Project-specific	Architect ²
Project-specific	Consultants/advisors ¹
Project-specific	Contractor ²
External	Municipality ³
External	Local residents/companies ³
External	Future users ³
External	Regulatory agencies ³

1: (Smith & Love, 2004); 2: (Newcombe, 2003); 3:(Ward & Chapman, 2008)

Following the method described earlier, stakeholders were grouped; see Table 11.

Table 11: Overview grouping stakeholders

Case study	Original stakeholders	Grouped as	Rationale for grouping
A	Internal expert sustainability, safety and installations	Internal experts	Overlapping role as internal expert
B	Project leader VOF: construction and installations	Contractor	Same overall role as the contractor
B	Project leader maintenance program: construction and installations	Project leader maintenance program	Overall responsibility for the maintenance component
B	Project leader maintenance municipality: construction and installations	Project leader maintenance municipality	Overall responsibility for the maintenance component
B	Architect	Architect + advisors	The architect and advisors were contracted separately but related to the same party. Therefore considered as one stakeholder for better comparison
A&C	Architect	Architect + advisors	The architect and advisors are contracted as one design team and are therefore considered one stakeholder
C	Supervisor construction and installations	Supervisor execution	Overall responsibility for the supervision during execution

Prior to the analysis, several stakeholders were also renamed to increase clarity and ensure consistency, facilitating better cross-case comparison. In case study A, "Project team client" was renamed to "Project management internal" and "Project manager" became "Project management external". Additionally, "Local congregation" was renamed to "Current building owner" and "Students, teaching and other staff" were renamed to "Future users" to clarify the role of these stakeholders in the project. In case study B, "Contract manager municipality" was renamed to "Municipality", "Project leader municipality" to "Project manager internal", and "Project leader program" to "Project management external". Similarly, in case study C, "PMC" was renamed to "Internal experts" to clarify its role and enable better comparison with case study A.

3.5. Definition of the measurement points

In this study, a longitudinal approach will be used to capture stakeholder dynamics over distinct project phases. This method involves constructing and analyzing a series of static networks (Ho et al., 2020), where each “snapshot network” represents the social network at a specific point in time (Legendi & Gulyás, 2014). By examining these discrete moments, this study tracks stakeholder dynamics as stepwise changes rather than continuous shifts. For this purpose, a predefined set of measurement points is established. It was earlier identified that Brink was involved from initiative to completion in all of the three selected case studies. Thus presenting no limitations in the selection of measurement points within these phases. In general, a construction project follows the phases of initiation, definition (planning and design), construction, handover commissioning, operation, and maintenance (Guan et al., 2020; Q. Li et al., 2020; Y. Li et al., 2022). Whereas in specific contexts there is also a phase of demolition before construction (Q. Li et al., 2020; Y. Li et al., 2022). In the Dutch construction industry, the so-called “DNR-STB” is used, which further specifies the design stage in sketch design, preliminary design, final design, technical design, and execution-ready design (BNA & NLingenieurs, 2014). In this study specifically, three project delivery methods will be assessed: Design & Build (D&B), Design-Bid-Build (DBB), and Engineer & Construct (E&C). In terms of the order of processes, Engineer and Construct is comparable to Design & Build; however, the contractor's design component is restricted to engineering (Van der Linden, n.d.). Figure 19 shows the sequence of steps in each of these three project delivery methods in a flowchart.

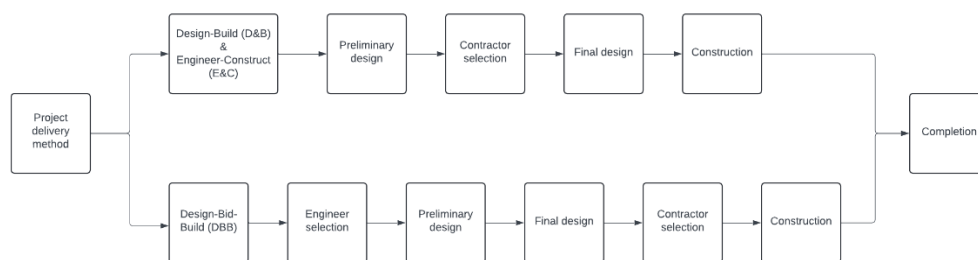


Figure 19: Flowchart selected project delivery methods (Park & Kwak, 2017; Van der Linden, n.d.)

By combining the general phasing of a construction project, the DNR-STB, and the selected project delivery methods, a defined set of measurement points can be established. This results in the following phases: initiation, preliminary design, final design, engineering, construction, and handover/completion; see Figure 20. No distinct definition phase has been defined since this process involves the preliminary and final design. Furthermore, sketch design is not defined as a separate phase because the stakeholders involved are the same as in the preliminary design phase; this assumption has been verified for the selected case studies (see Appendix B). Moreover, the technical and execution-ready design has been combined into the engineering phase, as these stages both involve the technical development of the design. Finally, no separate demolition phase is used, as the brownfield projects involve renovation rather than complete demolition; therefore, this is seen as part of the construction phase. This also ensures alignment of measurement, despite case study C being a greenfield project.



Figure 20: Selected measurement points

3.6. Definition of type of relationships of study

In terms of research methodology, a decision needs to be made between weighted or unweighted and directed or undirected networks. Weighted networks are used in this study because they are considered richer in information than unweighted networks, as each link is assigned a weight (Tabassum et al., 2018). To determine the weight of each link, the approach developed by Zhuang et al. (2019) will be adopted. This approach uses three parameters to gauge the strength of a connection:

- The presence of a contractual agreement → score = five.
- The presence of reciprocal interests or subordinate connections → score = three.
- Communication possibilities → score = one.
- None of the above relationships are present → a weighting of zero is assigned because no link exists.

Based on these scores, the weighted networks are visualized through an adjacency matrix; see Figure 21 (Xue et al., 2023). Additionally, the decision is made to use undirected networks, which assume a two-way interaction between two actors (Herrera et al., 2020). Undirected networks have been chosen as this fits well with the focus of this study on identifying the collaborative network of stakeholders and was also applied by Zheng et al. (2024), of which the earlier presented weighting approach is used. Moreover, according to the literature, a construction project can be seen as a collaboration of stakeholders who jointly develop a project (Yang et al., 2009; Srinivasan & Dhivya, 2020). As a result, there exists a bidirectional relationship between stakeholders. For instance, a client provides input to an architect on what he/she wants (client → architect), and on the basis of this information, they make a design, which they provide to the client (architect → client). This concept is also endorsed by Zhao et al. (2018), who argued that the owner and contractor have a close, reciprocal connection. This bidirectional interaction is effectively captured by undirected networks, making them a suitable method for studying stakeholders of construction projects.

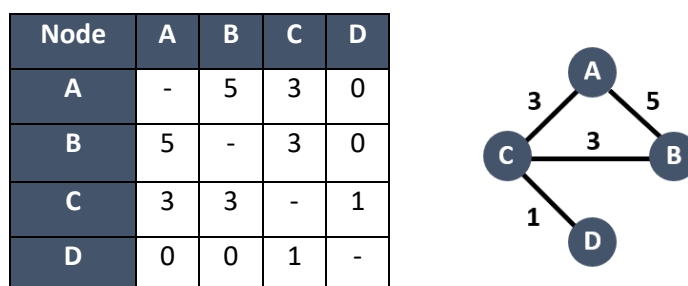


Figure 21: illustration adjacency matrix based on Tabassum et al. (2018)

3.7. Definition of SNA metrics

Social Network Analysis (SNA) applies a variety of quantitative methods (Borgatti et al., 2013). These mathematical metrics can be categorized into node-level and network-level metrics (Bolíbar, 2016). The type of metrics can be used for analyzing on the micro-, meso-, and macro-level. As discussed in Section 2.4.5, each of these three levels of analysis has its own strengths and weaknesses. Therefore, to gain a comprehensive understanding, a combination of the three levels is needed. Different metrics can be used for each of the levels. This section makes a final selection and explains why these metrics would aid in enhancing stakeholder management.

To determine which insights this needs to capture by utilizing Social Network Analysis (SNA), the literature review earlier presented in Chapter 2 can be used. The literature review revealed that there were a number of Critical Success Factors (CSFs) in the stakeholder analysis of construction projects. These CSFs were referred to as Stakeholder Assessment SFs (SASFs). In the paper of Oppong et al. (2017), the following six SASFs were listed:

- Assessing attributes (power, urgency and proximity) of stakeholders
- Assessing stakeholders' behaviors
- Analyzing conflicts and coalitions amongst stakeholders
- Understanding areas of stakeholders' interests
- Predicting the influence of stakeholders accurately
- Determining the strengths and weaknesses of stakeholders

Besides these CSFs it was also concluded that three types of stakeholder dynamics could be distinguished: (1) changes of involved stakeholders; (2) changes of relationships between stakeholders; (3) changes of attributes and characteristics of stakeholders (Aaltonen et al., 2015; Kereri & Harper, 2019; Oppong et al., 2021; J. Yang et al., 2009). Following this identification suitable SNA metrics needs to be selected to capture these CSFs and stakeholder dynamics.

1. Assessing attributes (power, urgency and proximity) of stakeholders

Assessing the stakeholders attributes is crucial as it is both a CSF and a dynamic component (Oppong et al., 2017, 2021; J. Yang et al., 2009). These attributes can be analyzed using centrality metrics (degree centrality, betweenness centrality, closeness centrality, and eigenvector centrality), with the exception of urgency, which cannot be assessed using SNA metrics. Table 12 presents the relevant SNA metrics for each of the stakeholder attributes.

Table 12: Relevant SNA for stakeholder attributes

Attribute	Relevant SNA metrics
Power	Degree-, eigenvector-, betweenness-, and closeness centrality
Urgency	-
Proximity	Closeness centrality

Attribute - Power

The capacity to establish dependencies, manage resources, and prioritize the interests of some group members or groups above those of others is referred to as power (Mitchell et al., 1997). This attribute can be assessed by combining insights from a number of SNA metrics. The first one is degree centrality, which assesses a node's degree of connectedness (Hewa Welege et al., 2021). This information is valuable for this attribute since a stakeholder with high degree centrality is more likely to have access to information and have an impact on decision-making (Zhuang et al., 2019). However, this metric does not take into account the strength of the neighboring nodes it is connected to; this limitation can be addressed by using eigenvector centrality as a complementary metric (Segarra & Ribeiro, 2016). Moreover, the presence of a link does not imply that the stakeholder can communicate with a large number of other stakeholders throughout the network. This depends on the closeness centrality (Zhuang et al., 2019). Finally, the metric of betweenness centrality also serves as an indicator of the power of a stakeholder (Zhuang et al., 2019). As higher-scoring stakeholders may operate as "middlemen", resulting in a powerful position within the network (Otte & Rousseau, 2002). Thus meaning that a stakeholder should score high on multiple metrics to be considered a powerful stakeholder, therefore the following threshold will be used in this study:

1. A stakeholder ranks among the top three on at least three of the four centrality metrics.
2. Or a stakeholder rank in the top three in the following pairs of metrics:
 - Degree centrality + eigenvector centrality
 - Degree centrality + closeness centrality
 - Degree centrality + betweenness centrality
 - Eigenvector centrality + closeness centrality
 - Eigenvector centrality + betweenness centrality
 - Betweenness centrality + closeness centrality

Attribute – Urgency

Urgency is the extent to which responding to requests from stakeholders requires quick action in disregard of other work obligations when the project (claims) and its outcomes are significant for the stakeholders as well as the project itself (Bahadorestani et al., 2019). It was previously discovered that this attribute consists of two main components: criticality and time sensitivity (Mitchell et al., 1997). The attribute of urgency connects a stakeholder demand to a particular point in time (Mitchell et al., 1997; Project Management Institute, 2017). As a result, it cannot be captured by an SNA metric, as it would require a qualitative research method, such as a survey or interview. As the focus in this study solely is on how SNA can be used in the stakeholder analysis process, this attribute is not further considered in this study.

Attribute - Proximity

Proximity is the distance that separates a stakeholder's active involvement and participation from that of the project (Bahadorestani et al., 2019). In order to assess proximity, the metric of closeness centrality can be used. This metric calculates a node's average distance to every other node (Chen et al., 2024).

Explanation of formulas

It was concluded that the three stakeholder attributes can be assessed by means of four SNA metrics: degree-, eigenvector-, betweenness-, and closeness centrality. The formulas for each of these metrics are discussed below.

Degree centrality:

Degree centrality is a metric that measures the number of other nodes that a particular node is linked to (Alarcón et al., 2013). This metric is denoted by k_i^w in the case of weighted networks and can be calculated on the basis of an weighted adjacency matrix. For this purpose, the following equation for undirected networks can be used:

$$k_i^w = \sum_{j=1}^n a_{ji}^w \quad (1)$$

In which a_{ji}^w denotes the weighted adjacency matrix with row i th and column j th. When referring to degree centrality in weighted networks, the term strength is used, which can be calculated by adding up the weights of the connections that are adjacent to a certain node used (Tabassum et al., 2018).

Eigenvector centrality:

This metric assesses how well one stakeholder is related to other well-connected stakeholders by assigning a relative score to each node. This score is determined by the adjacency matrix's first eigenvector. The fundamental concept of eigenvector centrality holds that a stakeholder's status and power are determined recursively by the status and power of other stakeholders to whom it is directly linked. Stated differently, one could argue that the centrality of a certain node i is proportional to the total of neighbors' centralities. To compute this metric, the following formula can be used:

$$x_i = \frac{1}{\lambda} \sum_{j=1}^n a_{ij} x_j \quad (2)$$

In which x_i/x_j indicates the centrality of node i/j , a_{ij} denotes the adjacency matrix and λ depicts the greatest eigenvalue of A (Tabassum et al., 2018).

Betweenness centrality:

Betweenness centrality b_v measures what proportion of the shortest pathways run through a given node. This metric can be computed by the following equation:

$$b_v = \sum_{s,t \in V(G) \setminus v} \frac{\sigma_{st}(v)}{\sigma_{st}} \quad (3)$$

In which the number of shortest pathways through node v is expressed by $\sigma_{st}(v)$, whereas σ_{st} indicates the amount of shortest pathways between node s and t (typically $\sigma_{st} = 1$) (Tabassum et al., 2018).

Closeness centrality:

Closeness centrality, expressed by the symbol Clv is a reachability metric that measures how quickly a particular node (actor) can connect to all other nodes within the network. Thus indicating its relative position in the network. In formal terms, this metric computes the average length of all the shortest pathways connecting a given node to every other node within the network. This calculation is done by the following equation:

$$Clv = \frac{n - 1}{\sum_{u \in V(G) \setminus v} d(u, v)} \quad (4)$$

In which $n - 1$, represents the number of nodes within the network minus one, since the particular node of study v is excluded. Whereas the second part of the equation indicates the sum of the shortest path length $d(u, v)$ from node v to every other node u within the network. While $u \in V(G) \setminus v$ denotes the set of all nodes v in the graph G , excluding node v (Tabassum et al., 2018).

2. Assessing stakeholders' behaviors

Stakeholders' behavior can be divided into three categories: observed behavior, cooperative potential, and competitive threat. Observed behavior describes the present state of the relationships among stakeholders on the problem at hand (Freeman, 1984). This can be studied by constructing a social network on the basis of an adjacency matrix that illustrates the relationship between stakeholders. Furthermore, the metric of degree centrality can be used to examine the number of relationships a particular stakeholder has at a given time. This analysis is also related to the statement, in addition to six SASFs, in the literature that it is crucial to consider the relationships among stakeholders (K. Y. Mok et al., 2015; J. Yang et al., 2011). In this way, both of these CSFs are addressed. The other two types of stakeholders' behavior, cooperative potential and competitive threat, cannot be assessed by means of SNA. Cooperative potential are specific actions that may be seen in the future to assist the organization in achieving its goals on the problem at hand. Conversely, competitive threats are actions that may be seen in the future that would hinder or contribute to the organization's failure to reach its objective (Freeman, 1984).

3. Analyzing conflicts and coalitions amongst stakeholders

Conflicts cannot be analyzed by using SNA metrics; on the other hand, coalitions can be. According to Kegler et al. (2010), coalitions can be defined as a group of stakeholders that collaboratively address common issues. In the SNA literature, these coalitions are referred to as subgroups or clusters within the network (Chen et al., 2024). To identify these clusters, the metric of modularity will be used. This metric quantifies how well a network is divided into communities or groups. Dense connections within communities and sparse connections between nodes in distinct groups are typical features of high modularity networks. The strength of this metric is that it also considers the connections between different subgroups, which the popular metric of clustering coefficient lacks (Lin & Wu, 2021). The formula of this metric is discussed below.

Modularity:

A network's community structure can be assessed using the metric modularity by examining the statistical organization of its connections (Newman & Girvan, 2004). Positive modularity values suggest the potential presence of a community structure, whereas negative values indicate the opposite. Therefore, it is possible to specifically search for community structure by identifying the network's segments with positive (ideally high) modularity values (Newman, 2004b). To compute the modularity Q , which can be at most one, the following equation can be used:

$$Q = \frac{1}{2m} \sum_{ij} (A_{ij} - \frac{k_i k_j}{2m}) \delta(c_i, c_j) \quad (5)$$

Where A_{ij} represents the adjacency matrix, which is equal to one if there is a link between nodes node i and j , and zero if there is not. The same holds for $\delta(c_i, c_j)$ which shows if node i and j are in the same community (denoted by one) or not (denoted by zero). Furthermore, k_i denotes the degree centrality of node i and m expresses the number of links (Newman, 2004a).

4. Understanding areas of stakeholders' interests

Of course, the interests of stakeholders cannot be identified by means of SNA. But this methodology can be used to increase our understanding about which interests are the most important ones to address and how these interests are related to each other. Previously conducted research by Mok et al. (2017) can be used as a basis for this. In this paper, they examined a stakeholder concern network by using SNA. For this purpose, a number of SNA metrics have been applied, of which a few of them will be adopted in this study. The first one is network density, as it offers information on how interconnected stakeholder interests are. In where a dense network structure suggests that the interests of several stakeholders are connected to one another. Furthermore, can the metrics of degree and betweenness centrality be used to identify the stakeholders interests with the highest influence.

In this particular paper, out-degree is used, but as earlier mentioned, does this study employ an undirected approach (see section 3.6). In undirected networks, no distinction is made between in- and out-degree. Therefore, degree centrality instead of out-degree will be used, as it reflects the number of connections a stakeholder has (Wasserman & Faust, 1994). According to this paper, (out-)degree centrality can be used to denote the influence of stakeholder interests on others. Where the interests of stakeholders with high (out-)degree centrality should receive more attention. On the other hand, betweenness centrality illustrates how powerful a stakeholder's interest is in regulating the flow of influence through a connection. They state that the complexity of stakeholder interests can be reduced by addressing core interests (high betweenness centrality). So it can be concluded that for this specific CSF, the metrics of density, degree centrality, and betweenness centrality can be used. The formula of the metric density is discussed below, as the equations for the other metrics have been presented previously.

Density:

In a network, the overall degree of connectivity is explained by the metric density expressed by the symbol ρ . It is defined by the ratio of the network's connections to the maximum number of connections that can exist, as stated in the following equation:

$$\rho = \frac{m(G)}{m_{max(G)}}, 0 < \rho < 1 \quad (6)$$

In which $m(G)$ denotes the number of connections present in the network and $m_{max(G)}$ represents the maximum number of possible connections, that in the case of undirected networks equals to $\frac{n(n-1)}{2}$. Density is a metric that, in a network without connections, equals a value of zero and increases to a value of one in a fully connected network. As a result, dense networks are associated with high density values and sparse networks with a low level of density (Tabassum et al., 2018).

5. Predicting the influence of stakeholders accurately

The attributes of power and influence are heavily related since power is a subset of influence (Bahadorestani et al., 2019). According to Mok et al. (2017), the level of influence of each stakeholder can be computed by executing a number of steps. The first step involves calculating the three centrality metrics: degree centrality, betweenness centrality, and closeness centrality. After calculation, these centrality metrics are being normalized so they fall between 0 and 1 (Jafari et al., 2020). This normalization process is important to counteract the impact of network size (Beauchamp, 1965). For the metrics of betweenness, closeness, and eigenvector centrality, the built-in normalization process of UCINET will be used. Whereas, in the case of degree centrality, the raw scores provided by UCINET will be manually normalized by the maximum possible degree. This approach allows for taking into account the weightings used in this study. For this process the following formula is used as a basis (Wasserman & Faust, 1994):

$$\text{Normalized degree centrality} = \frac{\text{Degree of node } i}{\text{Maximum possible degree}} \quad (7)$$

The centrality index is then calculated by taking the average of the three metrics (Dogan et al., 2015). Following this process, a stakeholder prioritization can be made (Yu et al., 2017). Finally, each stakeholder's level of influence can be determined by using the equation stated below (Lim & Finkelstein, 2012).

$$\text{Sin}f_u = \frac{R_{max} + 1 - \text{rank}(u)}{\sum_{v=1}^n [R_{max} + 1 - \text{rank}(v)]} \quad (8)$$

In which $\text{Sin}f_u$ denotes the influence level of stakeholder u and R_{max} expresses the maximum rank of the stakeholders. The fractional rank of stakeholder u is indicated by $\text{rank}(u)$, whereas n represents the total number of involved stakeholders (Lim & Finkelstein, 2012).

6. Determining the strengths and weaknesses of stakeholders

The strengths and weaknesses of stakeholders cannot be captured by using SNA. The SWOT matrix analysis is a commonly used technique for this purpose by researchers as well as companies. Through the methodical evaluation of important internal and external aspects, it makes it possible to identify strengths, weaknesses, opportunities, and threats (Shrestha et al., 2004). As this study's research focus is on SNA alone and not in combination with other complementary methods, this CSF will not be addressed in this study.

Summary

In this section, it is concluded that a number of SNA metrics can be applied to address five of the six previously identified CSFs of stakeholder analysis, aiding in effective stakeholder management. To also address the three types of stakeholder dynamics, a longitudinal SNA study will be employed by constructing a static network for each of the earlier defined measurement points (see section 3.5).

This approach allows for capturing changes in terms of involved stakeholders (type 1) and their relationships (type 2). The changes in stakeholders' attributes will be assessed by comparing the scores of the different SNA metrics over time, with the exception of the attribute urgency, as it cannot be directly measured using SNA metrics. In the same manner, the changes in stakeholders' behavior and interests will be captured. However, the changes in stakeholder interests will only be partly addressed, as this study focuses on their position within the network rather than identifying their exact interest of each stakeholder (e.g., money). Moreover, the strengths and weaknesses of stakeholders will not be assessed in this study because they cannot be captured using SNA metrics. Finally, changes in stakeholders' characteristics and attitudes toward the project will not be examined in this study, as they cannot be directly captured via SNA metrics. Furthermore, they are not listed as a CSF and therefore are considered beyond the scope of this study.

4. Results

In this section, the results of this study are presented, which include, first of all, general insights on the importance of stakeholder management and the awareness of stakeholder dynamics. In the second part of this section, the results of each of the case studies are discussed, which include network visualizations and outcomes of the Social Network Analysis. This information was gathered through document analysis and several interviews. The transcription of these interviews can be found in Appendix B. The detailed results of this analysis are presented in Appendix F, while the discussion and interpretation of these results are provided in this section.

4.1 Stakeholder management and dynamics

At the start of each interview, general questions have been asked about the importance of stakeholder management and awareness of stakeholder dynamics in the daily work of project management professionals in the construction industry. Insights were gathered from nine interviews, three for each case study, with professionals who are currently or were recently active in the construction industry. All interviewees held the role of project manager, either directly working for the client or representing the client as an external project manager; see Table 13 for an overview.

Table 13: Overview interviewees

Interviewee	Function	Case study
Project manager A	External project manager	A
Advisor-director A	External project manager	A
Project manager client A	Internal project manager	A
Project manager B	External project manager	B
Project manager client B	Internal project manager	B
Program manager internal B	External project manager	B
Project manager C1	External project manager	C
Project manager C2	External project manager	C
Project manager client C	Internal project manager	C

To analyze the results of the interview, grounded theory was used as a research method. This qualitative research method uses the following three coding procedures: 1) open coding, 2) axial coding, 3) selective coding (Q. Liu, 2022). The detailed results of this procedure are presented in Appendix C, while this section discusses the key insights derived from the analysis.

All interviewees emphasized the importance of stakeholder management in their daily work. Stakeholder management is seen by an interviewee as essential to be able to move forward and stresses the importance of early involvement of public parties to make the process smoother. Some of them see stakeholder management as an integral part of project management. This corresponds with claims in the literature (Assudani & Kloppenborg, 2010; Chung & Crawford, 2016; Srinivasan & Dhivya, 2020).

Which also means that it is not as explicitly labeled in practice as a separate task but more seen as an integral part of their work as project manager. Stakeholder management is seen as extra important by public clients since the outcomes of the project directly affect their own colleagues. Moreover, in one interviewee, it was stressed that the client is keen on working in good harmony and cooperation with the stakeholders. The utilized stakeholder management approach varies depending on the project complexity and stakeholder impact. Where in complex projects a more structured approach is used with an increased emphasis on stakeholder management. While the level of stakeholder impact affects the level of stakeholder engagement. This is consistent with claims in the literature of making a stakeholder prioritization (Sharpe et al., 2021). Furthermore, one interviewee makes the notion of making the distinction between stakeholders and shareholders, in which shareholders have decision-making authority and stakeholders are involved in the process but do not have formal decision-making power.

The interviewees showed shared awareness of stakeholder dynamics in construction projects. The majority of the interviewees mention the changes in involved stakeholders throughout the project life cycle, in which the involvement of the parties depends on the used project delivery method and their role in the project. This aligns with claims by Kereri and Harper (2019). In which the number of involved parties grows over time, according to one interviewee. But not only do the organizations involved change over time; the specific individuals within them change as well. To manage these stakeholder dynamics, one interviewee mentioned the importance of consistent contact points. Additionally, during one of the interviews, the notion of changes in interests and behavior is also mentioned, which corresponds with claims by Oppong et al. (2021). On the other hand, the third type of stakeholder dynamics mentioned in the literature (Oppong et al., 2021), namely changes of relationships between stakeholders, have not been mentioned once in one of the nine conducted interviews. Noticing a lack of awareness of this type of stakeholder dynamics.

4.2 Case study A

4.2.1 Case description

Case study A involves the expansion of a University of Applied Sciences, also referred to as HBO in Dutch, and is located in the province of North Brabant. As a public university like the majority in the Netherlands, it can be seen as a public project. For the expansion, an old monastery has been bought. Which, after purchase, was completely renovated into an educational facility. For this purpose, Engineer & Construct (E&C) as a project delivery method and UAC-IC as a contract type were used. Finally, this project was completed a few years ago, in which Brink was involved from the initiation till the completion.

4.2.2 Stakeholder identification

Table 14 provides an overview of the involved stakeholders of case study A at each of the six measurement points. If a particular stakeholder is involved in a specific phase, this is indicated by an "X".

Table 14: Stakeholder identification case study A

No.	Description	Involved phases					
		Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
C1	Supervisory Board	X	X	X	X	X	
C2	Executive Board (client)	X	X	X	X	X	X
C3	Academy Directors	X	X	X	X	X	X
C4	Sounding board academies	X	X	X			
C5	Department of property and facility management	X	X	X		X	X
C6	Project management internal	X	X	X	X	X	X
C7	Internal experts	X	X	X			
C8	Internal procurement department	X		X			
P1	Project management external	X	X	X	X	X	X
P2	Architect + advisors		X	X	X	X	X
P3	Interior architect			X	X	X	X
P4	Contractor				X	X	X
P5	Sub-contractors				X	X	X
E1	Current building owner	X	X	X	X	X	X
E2	Future users		X	X		X	X
E3	Municipality	X	X	X		X	X
E4	Other HBO institutions in the Netherlands		X				
E5	Other educational institutions in the municipality	X	X	X			
E6	Local residents		X	X		X	X
E7	Current user*	X					
E8	Housing corporation*	X					
E9	Public financier	X	X	X	X	X	X
E10	Fire department		X	X		X	X

Legend: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.; Engineering, Constr.: construction; Compl.: Completion.

*The current user refers to the group of people who occupy the building that the monastery's people will move into after they sell the property. To make this possible, the current users also needed a new place, which the housing corporation has realized for them.

4.2.3 Relationship evaluation

Table 15 provides an overview of the relationships between the stakeholders of case study A and when these are active. Moreover, in this table, the type of relationship and its assigned weighting are presented.

Table 15: Relationship evaluation case study A

Relationship type	Active phase(s)
Contractual agreement (weight = 5)	
C2 ↔ P1	Initiative - completion
C2 ↔ P2	Preliminary design - completion
C2 ↔ P3	Final design - completion
C2 ↔ P4	Engineering - completion
C2 ↔ E1	Initiative
C2 ↔ E3	Initiative
C2 ↔ E9	Initiative - completion
P4 ↔ P5	Engineering - completion
E7 ↔ E8	Initiative
Hierarchy (weight = 3)	
C1 ↔ C2	Initiative - construction
C2 ↔ C3	Initiative - completion
C2 ↔ C6	Initiative - completion
C2 ↔ E3	Preliminary design + final design + construction
C2 ↔ E10	Preliminary design + final design + construction + completion
Reciprocal interests (weight = 3)	
C2 ↔ E8	Initiative
C3 ↔ C6	Initiative - completion
C4 ↔ C6	Initiative – final design
C5 ↔ C6	Initiative – final design + construction - completion
C6 + P1 ↔ P2	Preliminary design - completion
C6 + P1 ↔ P3	Final design - completion
C6 + P1 ↔ P4	Engineering - completion
C6 ↔ C7	Initiative – final design
C6 ↔ C8	Initiative + final design
C6 ↔ E7	Initiative
P2 ↔ P4	Engineering - completion
P2 ↔ P3	Final design - completion
E3 ↔ E10	Preliminary design - completion
Communication possibilities (weight = 1)	
C2 + C3 ↔ E4	Preliminary design
C2 + C3 ↔ E5	Initiative – final design
C6 ↔ E1	Initiative - completion
C6 ↔ E2	Preliminary design + final design + construction + completion
C6 ↔ E3	Initiative - final design + construction - completion
C6 ↔ E6	Preliminary design + final design + construction + completion
C6 ↔ E10	Preliminary design + final design + construction + completion

4.2.4 Network visualizations

Network visualizations were created via NetDraw at each of the six measurement points; see Figures 16 through 21. These figures visualize the stakeholders present and their relationships using the types of stakeholder relationships described earlier. Colors represent the type of relationship, with red representing a contractual relationship, blue representing a hierarchical relationship, green representing a reciprocal interest relationship, and orange representing a communication relationship.

Initiative

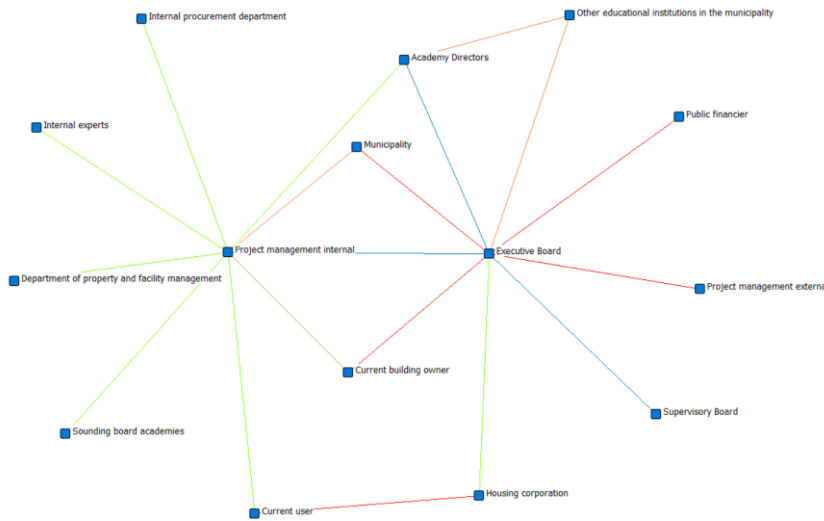


Figure 15: Network visualization initiative - Case study A

Preliminary design

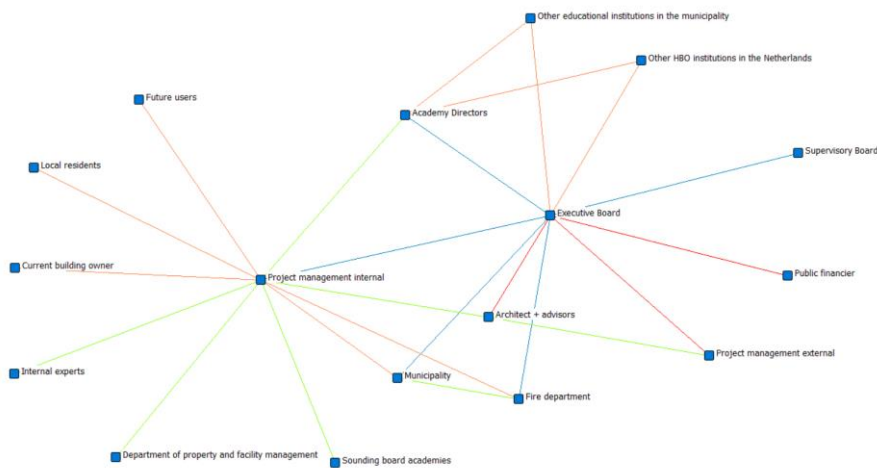


Figure 16: Network visualization preliminary design - Case study A

Final design

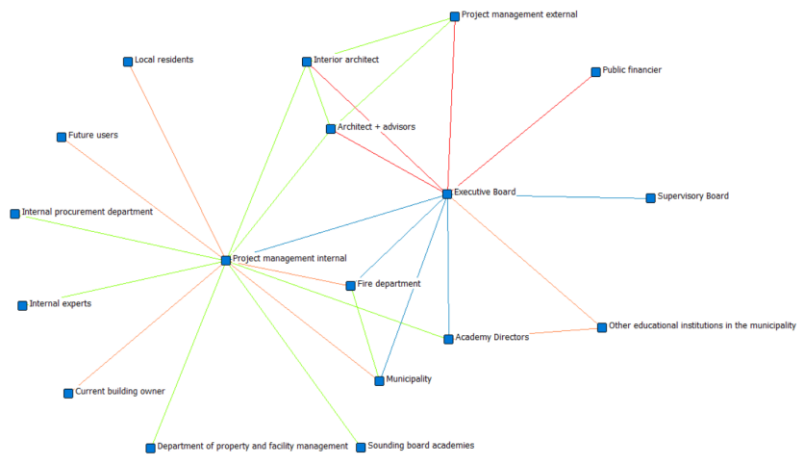


Figure 17: Network visualization final design - Case study A

Engineering

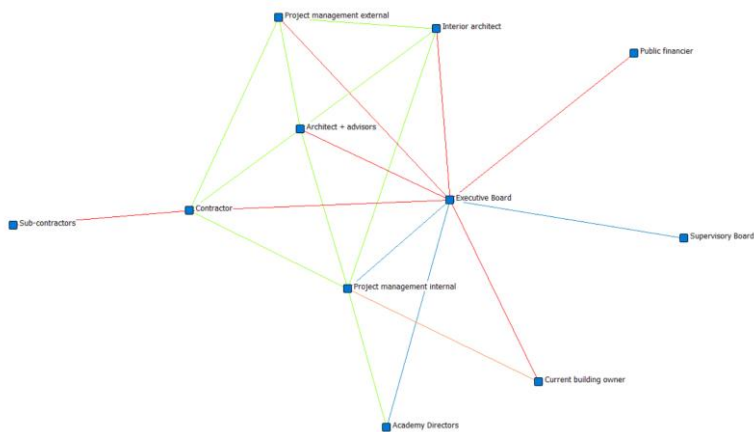


Figure 18: Network visualization engineering - Case study A

Construction

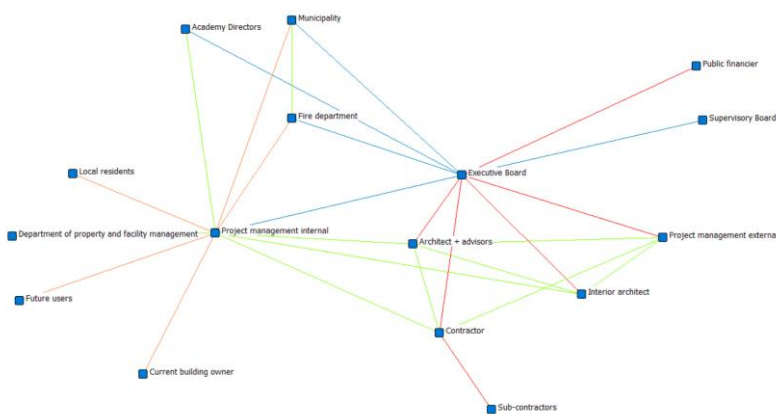


Figure 19: Network visualization construction - Case study A

Completion

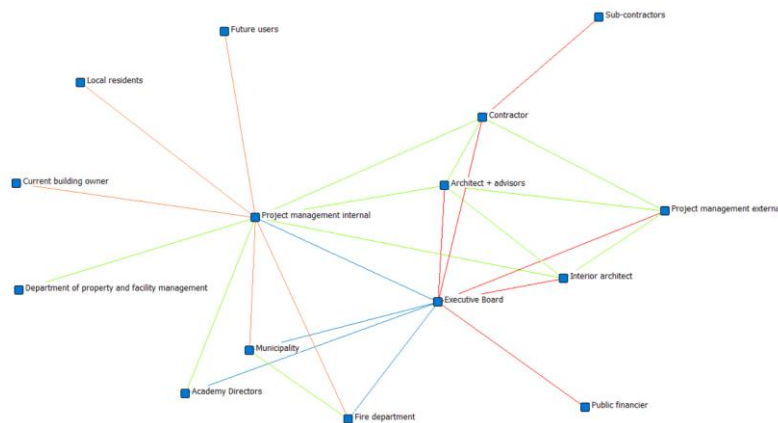


Figure 20: Network visualization completion - Case study A

4.2.5 Social Network Analysis (SNA)

On the network structures presented above, a Social Network Analysis (SNA) has been performed to understand the stakeholder characteristics and their underlying dynamics. This assessment is based on the earlier selected five Stakeholder Assessment Success Factors (SASFs) presented in the paper by Oppong et al. (2017).

SASF 1 - Assessing attributes of stakeholders

The three stakeholder attributes of power and proximity can be determined by using four centrality metrics: degree centrality, betweenness centrality, closeness centrality, and eigenvector centrality. In Table 16, the top 3 highest-scoring stakeholders for each of these metrics at each measurement point are presented.

Table 16: Stakeholders attributes – case study A

	Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
Degree	1. C2	1. C2	1. C2	1. C2	1. C2	1. C2
	2. C6	2. C6	2. C6	2. P4	2. C6	2. C6
	3. E7 & E8	3. P2	3. P2 & P3	3. P2	3. P4	3. P4
Betweenness	1. C6	1. C6	1. C6	1. C2	1. C6	1. C6
	2. C2	2. C2	2. C2	2. P4	2. C2	2. C2
	3. C3	3. C3	3. C3	3. C6	3. P4	3. P4
Closeness	1. C2 & C6	1. C6 2. C2	1. C6 2. C2	1. C2 2. C6	1. C6 2. C2	1. C6 2. C2
	2. C3	3. C3	3. P2 & P3	3. P2 & P4	3. P2 & P4	3. P2 & P4
	3. E1 & E3					
Eigenvector	1. C2	1. C2	1. C2	1. C2	1. C2	1. C2
	2. C6	2. P2	2. P2 & P3	2. P2	2. P2	2. P2
	3. E1 & E3	3. C6	3. C6	3. P4	3. P4	3. P3

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.; Engineering, Constr.: construction; Compl.: Completion.
Stakeholders: C2: Executive board (client), C3: Academy directors, C6: Project management internal, P2: Architect + advisors, P3: Interior architect, P4: Contractor, E1: Current building owner, E3: Municipality E7: Current user, E8: Housing corporation

Attribute - Power

The power of a stakeholder can be assessed by combining the insights from all four centrality metrics. It can be observed that in the initiative phase, the executive board (C2) and the internal project management (C6) score high on all of these metrics, making them the most powerful stakeholders in this phase. In addition, the academy directors (C3) score high both in terms of betweenness and closeness centrality, meaning that this stakeholder also has significant power in the network. As the current user (E7) and housing corporation (E8) only score high on degree centrality and not on one of the other metrics, their level of power is limited. In contrast, the current building owner (E1) and the municipality (E3) can be denoted as powerful due to high levels of eigenvector centrality, meaning that they are directly connected to other powerful stakeholders within the network. As well as showing high levels of closeness centrality, meaning they are also centrally located in the network, giving them power. In the preliminary design phase, the executive board (C2), internal project management (C6), and academy directors (C3) remain powerful. In contrast, does this not hold for the current building owner (E1) and the municipality (E3), which do not possess a powerful position during this phase. They are replaced by the architect and advisors (P2), showing high levels of degree and eigenvector centrality. In the final design phase, these stakeholders, with the exception of the academy directors (C3), remain a powerful position within the network. Furthermore, the interior architect (P3) is a powerful stakeholder in this phase. In the engineering phase, the executive board (C2), internal project management (C6), and architect and advisors (P2) remain powerful, whereas the interior architect (P2) becomes less powerful. A new powerful stakeholder in this phase is the contractor (P4). These four stakeholders remain the most powerful in the last two phases (construction and completion). Table 17 lists the powerful stakeholders at each stage of the project, with the most powerful (high scores on a minimum of 3 out of 4 metrics) stakeholders in bold .

Table 17: Powerful stakeholders - Case study A

Phase	Powerful stakeholders	
Initiative	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal ▪ Academy directors 	<ul style="list-style-type: none"> ▪ Current building owner ▪ Municipality
Preliminary design	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Architect + advisors ▪ Academy directors
Final design	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Architect + advisors ▪ Interior architect
Engineering	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Contractor 	<ul style="list-style-type: none"> ▪ Architect + advisors ▪ Project management internal
Construction	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Contractor 	<ul style="list-style-type: none"> ▪ Project management internal ▪ Architect + advisors
Completion	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Contractor 	<ul style="list-style-type: none"> ▪ Project management internal ▪ Architect + advisors

Attribute - Proximity

The attribute proximity can be assessed by means of the metric of closeness centrality (Chen et al., 2024). It can be observed that in the first two phases (initiative and preliminary design), the executive board (C2), the internal project management (C6), and academy directors (C3) are the most proximate stakeholders within the network. Whereas in the initiative phase, the current building owner (E1) and the municipality (E3) are also proximate stakeholders. In the final design phase, the executive board (C2) and the internal project management (C6) remain closely positioned within the network. Additionally, the architect and advisors (P2) and interior architect (P3) show high levels of closeness centrality in this phase. In the following three phases, the executive board (C2), internal project management (C6), and architect and advisors (P2) remain proximate stakeholders. Moreover, the contractor (P4) also shows high levels of closeness centrality in these three phases. Table 18 lists the proximate stakeholders at each stage of the project.

Table 18: Proximate stakeholders - Case study A

Phase	Proximate stakeholders
Initiative	<ol style="list-style-type: none">1. Executive board (client) & project management internal2. Academy directors3. Current building owner & municipality
Preliminary design	<ol style="list-style-type: none">1. Project management internal2. Executive board (client)3. Academy directors
Final design	<ol style="list-style-type: none">1. Project management internal2. Executive board (client)3. Architect + advisors & interior architect
Engineering	<ol style="list-style-type: none">1. Executive board (client)2. Project management internal3. Architect + advisors & contractor
Construction	<ol style="list-style-type: none">1. Project management internal2. Executive board (client)3. Architect + advisors & contractor
Completion	<ol style="list-style-type: none">1. Project management internal2. Executive board (client)3. Architect + advisors & contractor

SASF 2 - Assessing stakeholders' behaviors

Stakeholders' behavior can be divided into three categories: observed behavior, cooperative potential, and competitive threat. In where the observed behavior describes the present state of the relationships among stakeholders on the problem at hand (Freeman, 1984). This type of stakeholder behavior can be assessed by means of looking at present relationships in a network and the degree centrality of each node. As this study focuses on the dynamic component, the changes in stakeholder behavior are the main focus. Within this case study, four types of changes have been observed.

1. Dynamics of the number of nodes and ties

As the project progresses, the number of nodes (stakeholders) and the number of ties change over time; see Table 19. Beginning with the number of nodes, it can be observed that it increases from the initiative up to the final design, in which phase it peaks. In the engineering phase, one can note the lowest number of nodes, after which it increases in the construction phase and stabilizes in the next phase. In terms of the number of ties, a similar pattern can be observed.

Table 19: Dynamics of the number of nodes and ties - Case study A

Phase	No. of nodes	No. of ties
Initiative	15	19
Preliminary design	17	24
Final design	18	27
Engineering	11	20
Construction	16	27
Completion	15	26

2. Shift from contractual to communication relationship

In the initiative phase, a contractual agreement is present between the executive board and the current building owner. In addition, there is a communication relationship between the project team client and this same building owner. After the monastery is bought, only the communication relationship remains present.

3. Shift from contractual to hierarchy

There is a contractual relationship between the executive board and the municipality in the initiative phase, as a ground lease agreement has been signed. Whereas this shifts to a hierarchical relationship from the preliminary design phase on till completion, since the environmental permit, for instance, needs to be approved by the municipality.

4. Changes in degree centrality of stakeholders

In terms of the degree centrality of stakeholders, also some dynamics can be observed; the most significant ones are the following:

- *Executive board*: significant increase from 0.400 in the preliminary design phase to 0.780 in the engineering phase, after that dropping again in the construction phase to 0.533 after it stabilizes.
- *Project management external*: significant increase from 0.071 in the initiative phase to 0.200 in the completion phase.
- *Architect + advisors*: significant increase from 0.138 in the preliminary design phase to 0.340 in the engineering phase, after that dropping again in the construction phase to 0.227.
- *Interior architect*: significant increase from 0.165 in the final design phase to 0.280 in the engineering phase, after that dropping again in the construction phase to 0.187.
- *Contractor*: significant decrease from 0.380 in the engineering phase to the construction phase to 0.253.

SASF 3 - Analyzing conflicts and coalitions amongst stakeholders

As discussed earlier, conflicts cannot be analyzed by using SNA metrics; on the other hand, coalitions can be. Coalitions can be defined as a group of stakeholders that collaboratively address common issues (Kegler et al., 2010). Specifically when conducting a Social Network Analysis (SNA), these coalitions are referred to as subgroups or clusters within the network (Chen et al., 2024). These clusters can be identified by means of the metric modularity; see Figures 22 to 27 for the scores. It can be seen that the modularity scores remain quite stable, meaning consistent levels of cluster formation throughout the project. This is with the exception of the engineering phase, which shows a negative modularity score, meaning that this network cannot be properly divided into clusters. As a consequence, the result can be considered invalid.

In the initiative phase, three clusters can be observed: 1) project management internal with internal departments, the municipality, and current building owner, 2) current user; 3) executive board with all other internal and external stakeholders. In the preliminary design phase, a similar pattern can be observed as in the first phase but without the current user, leading to two clusters. The same applies to the final design phase, with the exception that a new additional cluster is formed containing the municipality and fire department. In the construction phase, the network is similar to the preliminary design phase, consisting of two clusters. Finally, in the completion phase, the network consists of one extra cluster, consisting of all the external contracted parties, who will be together responsible for the successful completion of the project.

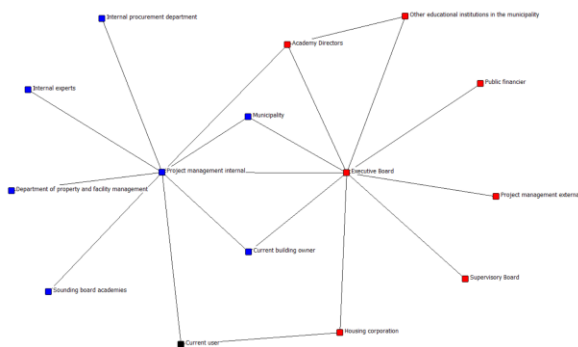


Figure 21: Stakeholder clusters initiative - Case study A

Partition w/ 3 clusters: Q = 0.231

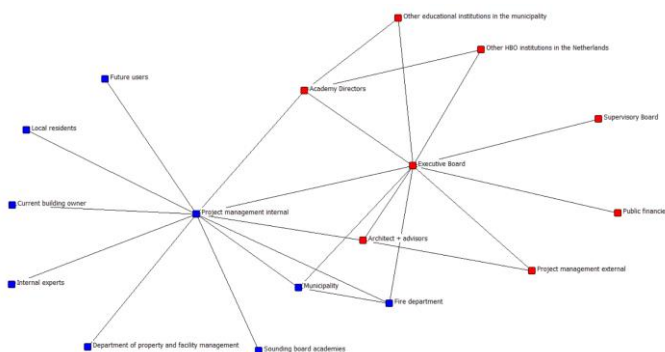


Figure 22: Stakeholder clusters preliminary design - Case study A

Partition w/ 2 clusters: Q = 0.291

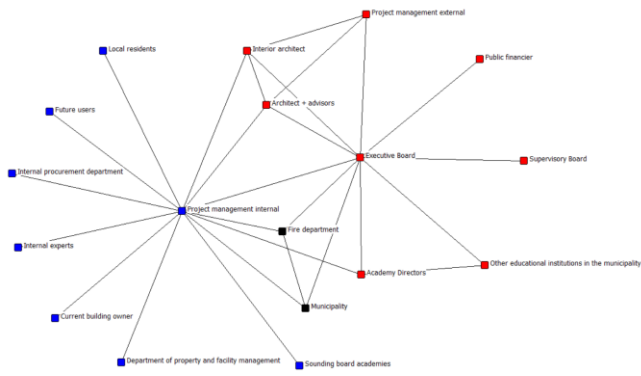


Figure 23: Stakeholder clusters final design - Case study A

Partition w/ 3 clusters: Q = 0.285

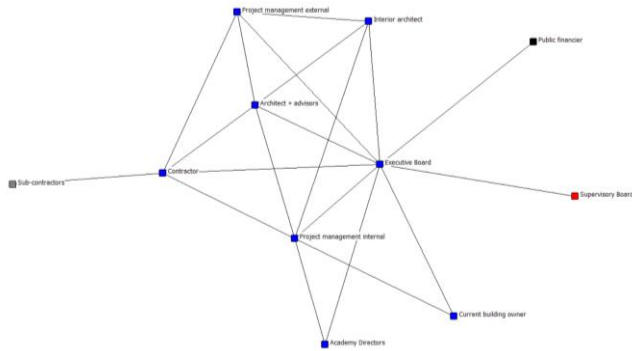


Figure 24: Stakeholder clusters engineering - Case study A

Partition w/ 4 clusters: Q = -0.007

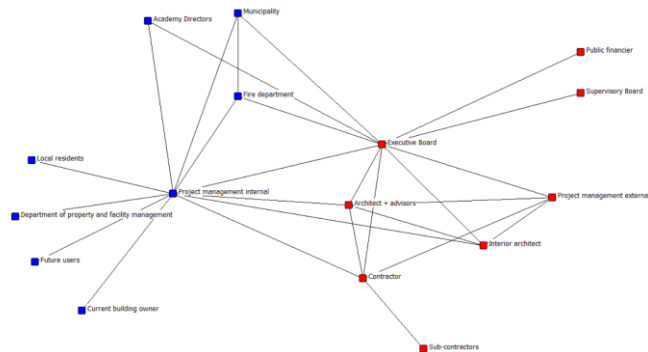


Figure 25: Stakeholder clusters construction - Case study A

Partition w/ 2 clusters: Q = 0.230

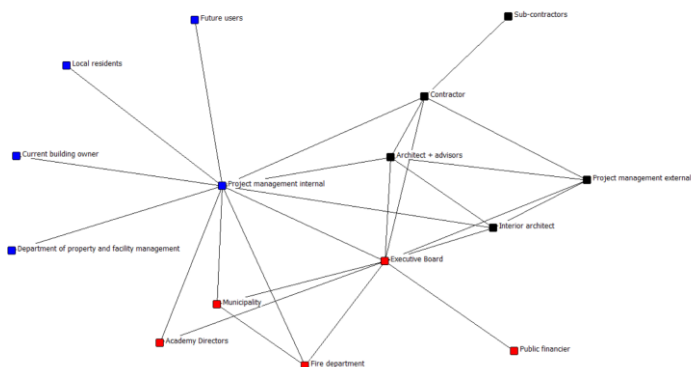


Figure 26: Stakeholder clusters completion - Case study A

Partition w/ 3 clusters: Q = 0.240

SASF 4 - Understanding areas of stakeholders' interests

Stakeholders' interests can be understood by combining the results of different SNA metrics research by Mok et al. (2017). First of all, the metric of network density offers information on how interconnected stakeholder interests are. In where a dense network structure suggests that the interests of several stakeholders are connected to one another. In Table 20, an overview is presented of how the density of the network evolves across the project life cycle. The density remains relatively stable in the first three phases, indicating a consistent but limited level of connection between stakeholders interests. In the engineering phase, density increases significantly and also peaks, reflecting the highest level of interest connectedness. This is followed by a decrease in the construction phase and a slight increase at the completion of the project.

Table 20: Density - Case study A

Phase	Density	Std Dev.
Initiative	0.181	0.385
Preliminary design	0.176	0.381
Final design	0.176	0.381
Engineering	0.364	0.481
Construction	0.225	0.418
Completion	0.248	0.432

Additionally, the metrics of degree and betweenness centrality can be used to identify the stakeholders interests with the highest influence. The interest of stakeholders with high degree centrality should receive more attention. On the other hand, betweenness centrality illustrates how powerful a stakeholder's interest is in regulating the flow of influence through a connection. The complexity of stakeholder interests can be reduced by addressing core interests (high betweenness centrality). So overall, the focus should be on the interests of stakeholders with a high degree or betweenness centrality. In Table 21, an overview is presented of the top 3 stakeholders with the highest degree and betweenness centrality at each stage of the project.

Table 21: Stakeholders' interests - Case study A

	Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
Degree	1. C2	1. C2	1. C2	1. C2	1. C2	1. C2
	2. C6	2. C6	2. C6	2. P4	2. C6	2. C6
	3. E7 & E8	3. P2	3. P2 & P3	3. P2	3. P4	3. P4
Betweenness	1. C6	1. C6	1. C6	1. C2	1. C6	1. C6
	2. C2	2. C2	2. C2	2. P4	2. C2	2. C2
	3. C3	3. C3	3. C3	3. C6	3. P4	3. P4

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.: Engineering, Constr.: construction; Complet.: Completion.
Stakeholders: C2: Executive board (client), C3: Academy directors, C6: Project management internal, P2: Architect + advisors, P3: Interior architect, P4: Contractor, E7: Current user, E8: Housing corporation

In the first three phases, the stakeholders with the highest degree centrality remain the same, namely the executive board (C2) and the internal project management (C6), taking the first two spots. However, the third spot changes; in the initiative phase, this is taken by the current user (E7) and the housing corporation (E8). Whereas in the preliminary this is done by the architect and advisors (P2). The same holds for the final design phase, with the addition of the interior architect (P3). In terms of betweenness centrality, a similar pattern can be observed, with the internal project management (C6) showing the highest closeness centrality, followed by the executive board (C2) and academy directors (C3) across all of the first three phases.

Looking at the next third phases, it can be observed that the executive board (C2) and internal project management (C6) remain to show high levels of betweenness centrality. The same holds in terms of degree centrality with the exception of the internal project management in the engineering phase. Furthermore, it can be seen that the interests of the contractor (P4) become important from the engineering phase. In this phase, the interests of the architect and advisors (P2) are also still important. Finally, in the last two phases of construction and completion, the interests of the same three stakeholders need to be prioritized; these are the executive board (C2), project management internal (C6), and contractor (P4). On the basis of this information, a prioritization of stakeholders' interests can be made; see Table 22.

Table 22: Prioritization of stakeholders' interests - Case study A

Phase	Prioritization of stakeholders' interests	
Initiative	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal ▪ Academy directors 	<ul style="list-style-type: none"> ▪ Current user ▪ Housing corporation
Preliminary design	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Academy directors ▪ Architect + advisors
Final design	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal ▪ Academy directors 	<ul style="list-style-type: none"> ▪ Architect + advisors ▪ Interior architect
Engineering	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Architect + advisors ▪ Contractor
Construction	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Contractor
Completion	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Contractor

SASF 5 - Predicting the influence of stakeholders accurately

By combining the results from the three centrality metrics of degree, betweenness, and closeness centrality, the level of influence for each of the stakeholders can be calculated. The focus will be on identifying the stakeholders with the highest levels of influence at each measurement point, highlighting the most influential actors within the network. An overview of the top 3 most influential stakeholders at each measurement point is presented in Table 23. On the basis of this overview, a few conclusions can be drawn. The most influential stakeholder across all phases is the executive board (C2), who is the client of this project. Internal project management (C6) is the second most influential stakeholder across all phases with the exception of the engineering phase. Wherein this position is taken by the contractor (P4). The third most influential stakeholder differs between different phases; in the initiative phase, this is taken by the current user (E7) and housing corporation (E8). In the preliminary design till engineering phase, this is taken by the architect and advisors (P2); specifically, in the final design phase, this position is taken together with the interior architect (P3). Finally, in the last two phases, construction and completion, this third place is occupied by the contractor (P4).

Table 23: Stakeholders influence - Case study A

Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
1. C2	1. C2	1. C2	1. C2	1. C2	1. C2
2. C6	2. C6	2. C6	2. P4	2. C6	2. C6
3. E7 & E8	3. P2	3. P2 & P3	3. P2	3. P4	3. P4

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.: Engineering, Constr.: construction; Complet.: Completion.
Stakeholders: C2: Executive board (client), C6: Project management internal, P2: Architect + advisors, P3: Interior architect, P4: Contractor, E7: Current user, E8: Housing corporation

4.3 Case study B

4.3.1 Case description

Case study B involves the renovation of a municipal office located in the province of North Brabant. The renovation includes sustainability improvements through new installations and an updated interior. This project is part of a broader sustainability program initiated by the municipality and can be considered a public project since the client is the municipality itself. In this project, a so-called "shoulder principle" is utilized, which means that for each person from the municipality (internal), there is a corresponding person overseeing the whole program (external). Furthermore, for the renovation, the Design & Build (D&B) project delivery method and UAC-IC contract type were utilized. Finally, this project was recently completed, with Brink involved from the initiation till the completion.

4.3.2 Stakeholder identification

Table 24 provides an overview of the involved stakeholders of case study B at each of the six measurement points. If a particular stakeholder is involved in a specific phase, this is indicated by an "X".

Table 24: Stakeholder identification case study B

No.	Description	Involved phases					
		Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
C1	Municipality	X	X	X	X	X	X
C2	Program director (client)	X	X	X	X	X	X
C3	Program manager internal	X	X	X	X	X	X
C4	Project management internal	X	X	X	X	X	X
C5	Project leader ICT			X	X	X	X
C6	Project leader facility management			X	X	X	X
C7	Financial manager internal	X	X	X	X	X	X
C8	Performance manager internal	X	X	X	X	X	X
C9	Project leader maintenance internal			X	X	X	X
C10	Communication expert internal		X	X		X	X
P1	Program manager external	X	X	X	X	X	X
P2	Project management external	X	X	X	X	X	X
P3	Contractor		X	X	X	X	X
P4	Architect + advisors	X	X	X	X	X	X
P5	Financial manager external	X	X	X	X	X	X
P6	Performance manager external	X	X	X	X	X	X
P7	Project leader maintenance external		X	X	X	X	X
P8	Communication expert external		X	X		X	X
E1	Local residents					X	
E2	Future users		X	X		X	X
E3	Owner temporary housing			X	X	X	

Legend: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.; Engineering, Constr.: construction; Comple.: Completion.

4.3.3 Relationship evaluation

Table 25 provides an overview of the relationships between the stakeholders of case study B and when these are active. Moreover, in this table, the type of relationship and its assigned weighting are presented.

Table 25: Relationship evaluation case study B

Relationship type	Active phase(s)
Contractual agreement (weight = 5)	
C1 ↔ C2	Initiative - completion
C2 ↔ P1 + P2	Initiative - completion
C2 ↔ P3	Preliminary design - completion
C2 ↔ P4	Initiative
C2 ↔ P5 + P6	Initiative - completion
P3 ↔ P4	Preliminary design - completion
C2 ↔ P7	Preliminary design - completion
C2 ↔ P8	Preliminary design – final design + construction - completion
C2 ↔ E3	Final design - construction
Hierarchy (weight = 3)	
C1 ↔ C3	Initiative - completion
C1 ↔ C4	Initiative - completion
C3 ↔ C7 + C8	Initiative - completion
C3 ↔ C10	Preliminary design - completion
P1 ↔ P5 + P6	Initiative - completion
P1 ↔ P8	Preliminary design – completion
P2 ↔ P3	Preliminary design - completion
P2 ↔ P4	Initiative – completion
Reciprocal interests (weight = 3)	
C3 ↔ C4	Initiative - completion
C3 ↔ P1	Initiative - completion
P1 ↔ P2	Initiative - completion
C4 ↔ P2	Initiative - completion
P2 ↔ P7	Preliminary design - completion
P3 ↔ P7	Preliminary design – completion
C4 ↔ C5 + C6	Final design - completion
C4 ↔ C9	Final design - completion
C7 ↔ P5	Initiative - completion
C8 ↔ P6	Initiative - completion
C9 ↔ P7	Final design - completion
C10 ↔ P8	Preliminary design – final design + construction - completion
Communication possibilities (weight = 1)	
C10 + P8 ↔ E1	Construction
C10 + P8 ↔ E2	Preliminary design – final design + construction - completion

4.3.4 Network visualizations

A network visualization was created via NetDraw at each of the six measurement points; see Figures 28 through 33. To ensure the readability of this thesis, these figures are presented in Appendix D. These figures visualize the stakeholders present and their relationships using the types of stakeholder relationships described earlier. Colors represent the type of relationship, following the same color scheme as in case study A.

4.3.5 Social Network Analysis (SNA)

For conducting the Social Network Analysis (SNA), the same approach is used as shown in case study A, wherein the focus has been on the earlier selected five (SASFs) proposed by Oppong et al. (2017). To maintain the readability of this thesis and avoid redundancy, the detailed analysis is presented in Appendix E, while the main takeaways are stated below.

SASF 1 - Assessing attributes of stakeholders

- The client is a powerful and proximate stakeholder across the whole project life cycle.
- The program managers (internal and external) and project managers (internal and external) are the other powerful and proximate stakeholders during the project.

SASF 2 - Assessing stakeholders' behaviors

- The number of nodes and ties changes over time, with the highest numbers in both cases occurring during the construction phase.
- Shift in contractual party of architect and advisors after the initiative phase (program director → contractor).
- The degree centrality of stakeholders (e.g., municipality) fluctuates considerably and reflects shifts in their level of involvement and influence during the project phases.

SASF 3 - Analyzing conflicts and coalitions amongst stakeholders

- Clearer cluster formation as the project evolves, with the exception of the temporary decrease in modularity observed in the engineering phase.

SASF 4 - Understanding areas of stakeholders' interests

- The highest level of interest connectedness at the start of the project.
- The stakeholders' interests of the client should be prioritized during the whole project life cycle.
- The program managers (internal and external) and project managers (internal and external) are the other stakeholders whose interests should be prioritized during the project.

SASF 5 - Predicting the influence of stakeholders accurately

- The client of this project is the most influential stakeholder throughout the whole project life cycle.
- The program managers (internal and external) and project managers (internal and external) are the other influential stakeholders during the project.

4.4 Case study C

4.4.1 Case description

Case study C involves the construction of a new leisure facility in the province of Limburg. The client of this project is a public entity and, as a result, can be considered a public project. For this project, a traditional approach with a Design-Bid-Build as a project delivery method and UAC as a contract type has been used. Finally, this project was completed a few years ago, with Brink involved from the initiation till the completion.

4.4.2 Stakeholder identification

Table 26 provides an overview of the involved stakeholders of case study C at each of the six measurement points. If a particular stakeholder is involved in a specific phase, this is indicated by an "X".

Table 26: Stakeholder identification case study C

No.	Description	Involved phases					
		Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
C1	Shareholder	X			X		
C2	Supervisory board	X			X		
C3	Executive board (client)	X	X	X	X	X	X
C4	Steering committee*	X	X	X	X	X	X
C5	Project management internal	X	X	X	X	X	X
C6	Concept team	X	X	X	X		
C7	Internal plan team	X	X	X	X	X	X
C8	Internal experts	X	X	X	X	X	X
P1	Project management external	X	X	X	X	X	X
P2	Concept developer		X	X	X	X	X
P3	Architect + advisors		X	X	X	X	X
P4	Contractor				X	X	X
P5	Co-contractors				X	X	X
P6	Specialist advisors		X	X	X	X	X
P7	Supervisor execution					X	X
P8	Certifying company fire safety						X
P9	Utility company			X	X	X	X
E1	Municipality	X	X	X	X	X	X
E2	Province	X					
E3	Surrounding companies	X	X	X	X	X	
E4	Rijkswaterstaat	X		X	X		
E5	Fire department			X	X	X	X
E6	Water board	X		X	X		
E7	Future users*	X	X	X	X	X	X

Legend: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.: Engineering, Constr.: construction; Complet.: Completion.

*Future users of the leisure facility are part of the steering committee, but are considered as separate stakeholders

4.4.3 Relationship evaluation

Table 27 provides an overview of the relationships between the stakeholders of case study 3 at each of the four measurement points. Moreover, in this table, the type of relationship and its assigned weighting are presented.

Table 27: Relationship evaluation case study C

Relationship type	Active phase(s)
Contractual agreement (weight = 5)	
C3 ↔ P1	Initiative - completion
C3 ↔ P2	Preliminary design - completion
C3 ↔ P3	Preliminary design - completion
C3 ↔ P4	Engineering - completion
C3 ↔ P5	Engineering - completion
C3 ↔ P6	Preliminary design - completion
C3 ↔ P9	Final design - completion
C3 ↔ E1	Initiative
P1 ↔ P7	Construction - completion
P4 ↔ P5	Engineering - completion
P4 ↔ P8	Completion
Hierarchy (weight = 3)	
C1 ↔ C3	Initiative + engineering
C2 ↔ C3	Initiative + engineering
C3 ↔ C4	Initiative - completion
C3 ↔ E7	Initiative - completion
C4 ↔ C5	Initiative - completion
C5 ↔ C6	Initiative - engineering
C5 ↔ C7 + C8	Initiative - completion
C5 ↔ P1	Initiative - completion
P1 ↔ P2 + P3 + P6	Preliminary design - completion
P1 ↔ P4 + P5	Engineering - completion
C3 ↔ E1	Preliminary design - completion
C3 ↔ E4	Initiative + final design + engineering
C3 ↔ E5	Final design - completion
C3 ↔ E6	Initiative + final design + engineering
Reciprocal interests (weight = 3)	
C3 ↔ E3	Initiative - construction
C4 ↔ E7	Initiative - completion
P3 ↔ P4 + P5	Engineering - completion
E1 ↔ E5	Final design - completion
E1 ↔ E5 + P8	Completion
P3 ↔ P9	Final design
P3 + P5 ↔ P9	Engineering - completion
Communication possibilities (weight = 1)	
E1 ↔ E2	Initiative
E1 ↔ E4	Initiative + final design - engineering
E1 ↔ E6	Initiative + final design - engineering

4.4.4 Network visualizations

A network visualization was created via NetDraw at each of the six measurement points; see Figures 34 through 39. To ensure the readability of this thesis, these figures are presented in Appendix D. These figures visualize the stakeholders present and their relationships using the types of stakeholder relationships described earlier. Colors represent the type of relationship, following the same color scheme as in case study A.

4.4.5 Social Network Analysis (SNA)

For conducting the Social Network Analysis (SNA), the same approach is used as shown in case study A, wherein the focus has been on the earlier selected five (SASFs) proposed by Oppong et al. (2017). To maintain the readability of this thesis and avoid redundancy, the detailed analysis is presented in Appendix E, while the main takeaways are stated below.

SASF 1 - Assessing attributes of stakeholders

- The client and external project management are powerful and proximate stakeholders across the whole project life cycle.
- In the preliminary design, designers and advisors are powerful stakeholders, and as of the engineering phase, the co-contractors become one.
- The steering committee is a proximate stakeholder from the start up to construction.
- Designers and advisors are proximate stakeholders in the preliminary design, construction, and completion phase.
- Constructing companies are proximate stakeholders in the last two phases.

SASF 2 - Assessing stakeholders' behaviors

- The number of nodes and ties changes over time, with the highest numbers in both cases occurring during the engineering phase.
- Shift from contractual to hierarchical relationship between the client and municipality.
- The degree centrality of stakeholders (e.g., architect + advisors) fluctuates considerably and reflects shifts in their level of involvement and influence during the project phases.

SASF 3 - Analyzing conflicts and coalitions amongst stakeholders

- Clearest cluster formation in the beginning of the project.

SASF 4 - Understanding areas of stakeholders' interests

- Highest levels of interest connectedness at the end of the project.
- The stakeholders' interests of the client and internal/external project managers should be prioritized during the whole project life cycle.
- From the engineering phase, the interests of the construction parties should be prioritized.

SASF 5 - Predicting the influence of stakeholders accurately

- The client is the most influential stakeholder throughout the whole project life cycle.
- The internal/external project managers are influential stakeholders during all phases.

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5. Comparison of case study results

After discussing the results of each case study separately, this section will start with comparing the results with each other to identify consistent and contradictory results. The same five Stakeholder Assessment Success Factors (SASFs) will be used for this analysis.

SASF 1 - Assessing attributes of stakeholders

Attribute - Power

When comparing the most powerful stakeholders at each stage across the three case studies, a number of similarities and contradictions can be identified. First of all, it can be observed that in all three case studies, the client is a powerful stakeholder throughout all project phases. In addition, in case study A, the architect and its advisors are powerful stakeholders from the preliminary design till completion. Whereas in case study C this only applies to the preliminary design phase, this is with the notion that specifically in this case study also other designers and advisors are powerful during this phase. On the other hand, in case study B, the architect and advisors are not considered powerful stakeholders. This is due to the used project delivery method, which is a design-and-build, meaning the architect and advisors are part of the contract between the client and the contractor. Thus giving this stakeholder a less powerful position than in the other two cases.

In terms of the contractor, in case study A, the contractor is powerful from engineering till completion. The same applies to case study C, but with the notion that this is specifically the co-contractor in the first two phases and particularly the contractor only in the completion phase. This is due to the difference in contractual arrangements between the case studies. In case study A, a main contractor in combination with subcontractors is used. Whereas in case study C a (coordinating) contractor with co-contractors construction is used. On the other hand, in case study B, the contractor is not considered one of the most powerful stakeholders at all. A possible explanation for this is that this case study B is part of a program and the others are not. This can also be observed by neglecting the program managers (internal and external) in the data results (see appendix F). As in such a scenario, the contractor would be a powerful stakeholder in the preliminary design phase, scoring high on degree and eigenvector centrality. While in the rest of the remaining phases, it is limitedly powerful, remaining in the third position of eigenvector centrality but having the fourth position in regards to degree centrality.

Moreover, it can be seen that in all cases the dedicated management entities are powerful from preliminary design till completion. Where in case studies A and C this stakeholder is also already powerful in the initiative phase. However, if this management entity is internal, from the client itself, or external (hired), it differs between the case studies. This difference is mainly the result of the agreements made between the internal project management team and the external one. Furthermore, when the project is part of a wider program, as in case study B, the program manager is also a powerful stakeholder during the whole project life cycle with the exception of the engineering phase.

That case study B, which is part of a program, also causes the fact that the management entity is not considered already powerful in the initiative phase. Because when neglecting the program managers (internal and external) in the data results (see appendix F), it can be observed that the external project management is a powerful stakeholder in this phase. Additionally, it can be seen that the municipality is a powerful stakeholder in the initiative phase when the project involves a ground lease, as in case study A. This also holds for the current building owner in the same case study. This also holds for the academy directors in the initiative phase as well as the preliminary design phase. Finally, in case study C specifically, the steering committee is also a powerful stakeholder in the initiative phase.

Attribute – Proximity

By comparing the most proximate stakeholders at each stage of the three case studies, a number of similarities and contradictions can be identified. First, it can be noted that in all cases the client is a proximate stakeholder across all phases. The same holds for the management entity with the exception of case study B. In this case study, the management becomes a proximate stakeholder from the final design phase. If this management entity is internal, from the client itself, or external (hired), it differs between the case studies. Specifically, in case study B, which is part of a program, the program managers (internal and external) are proximate stakeholders in the initiative and preliminary design phase. The same explanation as earlier given applies to why the management entity is not a proximate stakeholder during the initiative and preliminary design phase of the case study. As when neglecting the program managers (internal and external) in the data results (see appendix F), the external project management in both phases would be considered a proximate stakeholder, scoring high on closeness centrality.

Furthermore, in both case studies A and C, the architect and advisors are proximate stakeholders. However, in case study A, this is from the final design till completion; specifically, in the final design phase, the interior architect is also a proximate stakeholder. Whereas in case study C this applies to the preliminary design, construction, and completion phase. This is with the notion that also other advisors are proximate stakeholders in the preliminary phase, namely the concept developer and specialist advisors. The same applies to the future users. In contrast, in case study B, the architect and advisors are not proximate stakeholders due to the selected project delivery method (design-and-build). Giving this stakeholder a less central position than in the other case studies. Additionally, in case studies A as well as C, the (co-)contractor is a proximate stakeholder in the construction and completion phase. Whereas in case study A this is also the case in the engineering phase. On the other hand, in case study B, the contractor is not a proximate stakeholder. In case study A, the academy directors are also proximate stakeholders from the initiative through the preliminary design phase. In addition, in this case study, the current building owner and municipality are also proximate stakeholders in the initiative phase. This is due to the building purchase with the current building owner and the ground lease agreement with the municipality. Finally, in case study C, the steering committee is a proximate stakeholder in the initiative till the engineering phase.

SASF 2 - Assessing stakeholders' behaviors

1. Changes in number of nodes and ties

It can be observed that in all case studies the number of nodes and ties changes over time; however, the pattern differs. Case studies A and B show an increase in the number of nodes, and noting a top at the final design, after it decreases in the engineering phase, it increases again and stabilizes. On the other hand, in case study C, the number of nodes decreases from the initiative to preliminary design, after increases and tops out in the engineering phase after it decreases and stabilizes. When looking at the number of ties, case studies A and B show a similar pattern as the number of nodes. But with the notion that the number of ties peaks at construction instead of final design in case study B. In case study C, the number of ties increases from initiative to engineering after it decreases and stabilizes.

2. Changes in relationship types

In all three case studies, a change in relationship types has been observed, proving the dynamic component of stakeholder relationships in practice. In both case studies A and C, the shift from a contractual to a hierarchical relationship between the municipality and the client can be observed. Since in both cases the municipality was the landowner. Furthermore, in case study A, an additional shift from a contractual to a communication relationship can be observed. Whereas case study B shows the shift in contracting party between the architect and advisors, from the client to the contractor. Resulting from early involvement in the initiative phase to the lack of internal knowledge of the client of this case study (appendix B). After it will become part of the contract that the client has with the contractor, due to the design-and-build project delivery method.

3. Changes in degree centralities of stakeholders

It can be observed that in which phase the degree centrality of the client peaks differs, indicating heightened influence in different phases. In case study A, the client peaks at the engineering phase, while in case study C this happens one phase later in the construction phase. Whereas, in case study B, the client shows the highest levels of degree centrality in the initiative phase and continuously decreasing till the completion of the project. Furthermore, in case studies A and C, the external project management shows increased degree centrality from the initiative phase. However, in case study A, the degree centrality of the external project manager peaks in the completion phase, whereas in case study C this happens in the construction phase. In contrast, in case study C, does this stakeholder show the opposite pattern, peaking in the initiative phase after it decreases. Moreover, in case studies A and C, the architect and advisors show increased degree centrality from the preliminary design till the engineering phase. Where it tops in case study A, whereas in case study C it increases till the construction phase. In case study B, the opposite is true, where this stakeholder is showing the highest levels of degree centrality at the beginning of the project instead of in later stages as the others.

In addition, the degree centrality of the contractor in case study A decreases from the engineering to the construction phase; the same applies to case study B, but not as significantly as case study A. In contrast, the degree centrality of the contractor of case study C increases at this stage of the project (engineering-construction). Furthermore, the contractor is showing the highest levels at different points of the project. In case study A this is in the engineering phase, whereas this applies to the preliminary design phase in case study B and in the completion phase of case study C. In terms of the municipality, both in case studies B and C, this stakeholder shows the highest levels of degree centrality at the beginning of the project. While in case study A the opposite is true, observing a top at the end of the project. Finally, all three case studies mention a number of other degrees of stakeholder centrality, but because these are not part of other case studies, they cannot be compared.

SASF 3 - Analyzing conflicts and coalitions amongst stakeholders

When comparing the modularity scores of the different scores, shown in Table 28, a number of similarities and contradictions can be noted. First, it can be noted that case study B shows the highest modularity scores, reflecting that this network can be the best divided into clusters. Case study A and case study C show similar modularity scores with the exception of the initiative and engineering phase. In the initiative phase, case study C is showing significantly higher modularity scores than case study A as well as B. In case study C, this is also the point in time when showing the highest modularity scores, indicating that at this stage the network can be the best divided into clusters. In contrast, case study A peaks in the preliminary design phase, while case study B does so in the construction phase. Finally, a negative value can be observed in the engineering phase of case study A, meaning that this network cannot be properly divided into clusters in this phase of the project. Whereas the other case studies do not show negative modularity scores.

Table 28: Comparison modularity scores between case studies

Phase	Case study A	Case study B	Case study C
Initiative	0.231	0.208	0.360
Preliminary design	0.291	0.319	0.256
Final design	0.285	0.335	0.288
Engineering	-0.007	0.271	0.264
Construction	0.230	0.368	0.218
Completion	0.240	0.347	0.284

On the basis of the highest modularity scores, the number of clusters was identified at each measurement point for each separate case study; see Table 29. When comparing the number of clusters and the type of stakeholders that it consists of, there can also be a number of similarities and differences identified. Beginning with the initiative phase, case studies A and C show similarities by consisting of three clusters and two similar clusters, including a cluster surrounding the client and one of the internal departments. The difference between them is that the third cluster consists of different stakeholders, the current user in case study A and governance bodies in case study C. In case study B, these two clusters (client and internal departments) can also be observed, with the addition of a new cluster for the performance managers and one for the financial managers.

In the preliminary design phase, all case studies show a cluster surrounding the client and internal departments. In case study B, there are two additional clusters: 1) performance and financial managers and 2) the communication experts with the future users. In case study C, on the other hand, there are three additional clusters: 1) steering committee with the future users, 2) municipality, and 3) surrounding companies. In the final design phase of case study A, as in the previous phase, with the exception that a new additional cluster is formed containing the municipality and fire department. In case study B, a similar pattern can be observed with the previous phase, but with the difference that the municipality is considered a separate cluster, similar to case study A, and there is one additional cluster formed around the owner of the temporary housing. In case study C, the basis is also similar to the previous phase, but with the differences that the client becomes part of the cluster of the governance bodies and that there form two new clusters surrounding the architect and advisors and one with the external project management.

In the next phase, the engineering phase, the network of case study A cannot be divided into clusters as earlier mentioned. When comparing the networks of the other two cases, it can be seen that case study C remains complex, consisting of six clusters, whereas case study shows the opposite, going from six to three clusters. Observing broader clusters in case study B in comparison with C. In the construction phase, the cluster formation in case study A is similar to the preliminary design phase, resulting in a less complex network as the other two case studies. Case study B consists of five clusters at this stage of the project, observing the same two clusters as case study A, but three additional ones: 1) program managers with financial and performance managers, 2) communication experts with future users, and 3) owner temporary housing. Case study C also consists of five clusters, observing also these two main clusters as in case studies A and B. However, the other clusters are different, consisting of 1) municipality, 2) surrounding companies, and 3) supervisor execution.

Moreover, at the completion phase, there forms an additional cluster of all the external contracted parties in case study A. The networks of case studies B and C are similar to their previous phase, but observing that the municipality is now in both cases a distinct cluster, the other differences and similarities remain. In conclusion, it can be seen that in all case studies a cluster is formed surrounding the client and one around the internal project manager. This is with the notion that in the engineering phase of case study A, this is not the case. But as early mentioned, does this network show a negative modularity score, meaning that it cannot be properly divided into clusters. Therefore, this is not taken into account further. Furthermore, in all case studies, stakeholders with interconnected roles in the project cluster together across all phases. Finally, it can be seen that the stakeholder network consists of a well-connected core with some peripheral stakeholders at each stage of the project.

Table 29: Comparison number of clusters between case studies

Phase	Case study A	Case study B	Case study C
Initiative	3	4	3
Preliminary design	2	4	5
Final design	3	6	6
Engineering	4	3	6
Construction	2	5	5
Completion	3	5	4

SASF 4 - Understanding areas of stakeholders' interests

In Table 30, a comparison of the density levels at each measurement point across the case studies is presented. It can be observed that each case study shows the highest and lowest levels of density at different points in time. Thus also indicating a difference in terms of the highest and lowest level of interests connectedness. Case study A shows significantly higher levels than the other case studies in the engineering phase, indicating higher levels of interest connectedness. Whereas case study B exhibits much higher levels of density at the initiative phase, indicating a well-connected network of stakeholder interests at the beginning of the project. In contrast case studies A and C show low levels of density at the beginning of the project. Specifically, case study C shows the highest levels of density in the completion phase. Case study A also shows high levels of density at the completion phase, reflecting increased levels of interests connectedness at the end of the project.

Table 30: Comparison density between case studies

Phase	Case study A	Case study B	Case study C
Initiative	0.181	0.345	0.171
Preliminary design	0.176	0.250	0.218
Final design	0.176	0.174	0.184
Engineering	0.364	0.213	0.167
Construction	0.225	0.176	0.213
Completion	0.248	0.199	0.228

It can be observed that prioritization of the interests of the client is needed throughout all the phases, no matter the project delivery method. A similar conclusion can be drawn for the dedicated management entities in case studies A and C, who are either internal, external, or both. In case study B, this also applies to all phases with the exception of the initiative phase. In this case study, as it is part of a wider program, the stakeholder interests of the program managers also need to be prioritized in all phases with the exception of the engineering phase. Being part of a wider program explains why in the initiative phase of case study B, the stakeholder interests of the management entity are not considered important. When neglecting the program managers (internal and external) in the data results (see appendix F), external project management shows high levels of degree and betweenness centrality. Another type of stakeholder whose interests across both case study A and C deserve prioritization is the contractor. In both cases, this is from engineering to completion, as this is the point at which the contractor becomes involved in the selected project delivery method.

Specifically, in case study C, the focus should be on the interest of the co-contractors during the engineering and construction phase and, at the completion of the project, on the interests of the contractor. Additionally, in case study A, the interests of the architect and advisors should be prioritized from the preliminary design till the engineering phase. While in the final design phase, this also applies to the interior architect. Moreover, in case study A, the interests of the current user and housing corporation, which are needed to make the project possible, should be prioritized in the initiative phase. Finally, in this case study, the interests of the academy directors should be prioritized in the initiative till the final design phase.

SASF 5 - Predicting the influence of stakeholders accurately

It can be first of all observed that in all case studies the client is an influential stakeholder during the whole project life cycle. The same holds for the project management entity. In case study A, is this stakeholder an influential stakeholder across all phases with the exception of the engineering phase. Whereas in case study C, this is an influential stakeholder in all phases. In contrast, in case study B, this applies to the final design till the completion phase. In the earlier phases of this case study, the program managers are influential stakeholders, which remains to be an influential stakeholder across all phases. As stressed earlier, being part of a program explains why the management entity is not an influential stakeholder in the early phases of case study B. When neglecting the program managers (internal and external) in the data results (see appendix F), external project management would be an influential stakeholder in the initiative and preliminary design phase. The influence of architects and advisors also differs between case studies. In case study A, the architect and advisors are influential stakeholders in the preliminary design till the engineering phase. Specifically in the final design phase, the interior architect is also an influential stakeholder. In the other case studies, no designers or advisors are considered an influential stakeholder. The same holds for the contractor, who is an influential stakeholder in the engineering till completion phase of case study A and not at all in the other case studies. Moreover, in case study A specifically, it was observed that the current user and housing corporation are influential stakeholders in the initiative phase. Finally, in case study C specifically, the steering committee is an influential stakeholder in the initiative phase.

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6. Discussion

6.1 Interpretation of the results

The results of this study show that stakeholder networks are dynamic, observing changes in terms of stakeholders, relationships, attributes, behaviors, interests, level of influence, and the overall network structure. Confirming the dynamic character of stakeholder networks mentioned in the literature (Kereri & Harper, 2019; Rowley, 1997; Tabassum et al., 2018). As well as confirming the previously identified type of stakeholder dynamics in the literature (Aaltonen et al., 2015; Kereri & Harper, 2019; Oppong et al., 2021; W. Wu et al., 2020; J. Yang et al., 2009). Specifically for relationships, it is not only the relationship itself that changes, but also the strength of the relationship. For example, observing the change from a contractual relationship (weight five) to a communication relationship (weight one) in case study A indicates a decrease in strength. Endorsing earlier statements made by W. Wu et al. (2020) and G. Wu et al. (2020). The interviewed project managers are partly aware of the observed dynamics, recognizing stakeholder, behavioral, and interest-related dynamics, with the strongest awareness of stakeholder changes. However, awareness of changes in attributes, relationships, level of influence, and overall network structure is lacking.

It can be concluded that some of these observed types of stakeholder dynamics are affected by the chosen project delivery method, whereas others are not. For instance, one of the main drivers of dynamics in terms of stakeholders is the used project delivery method, together with the role/responsibility of a stakeholder in the project and internal knowledge of the client. The utilized project delivery method has only influenced the project-related stakeholders, primarily the contractor. Since the project delivery method specifies when this party gets involved in the project. As a consequence, do the stakeholder network structures differ between project delivery methods, confirming the earlier statement by Hughes et al. (2015). The role and responsibilities of a stakeholder also influence the dynamics in terms of stakeholders by specifying in which phases a certain actor needs to be involved. This driver is related to all three stakeholder types: (client, project, and external). As a result, it can also be considered a driver behind changes in the network structure.

The last driver of dynamics in terms of stakeholders is the internal knowledge of the client, which caused the involvement of the architect and advisors in the initiative phase of case study B. Since, due to the lack of internal knowledge, these parties assisted in the process of drawing up a program of requirements. This same factor is the main driver behind the shift in the contractual party of the architect and advisors observed in case study B. On the other hand, the shift from a contractual to a hierarchical relationship is driven by the municipality's land ownership, which has a supervisory and monitoring role after the initiative phase. Finally, the last observed relationship change from a contractual to a communication relationship is driven by the wish of the client organization to keep working in good harmony and cooperation with the stakeholders (project manager client A).

In terms of stakeholder attributes, behaviors, interests, and level of influence, the project delivery method is also an influential factor, but not for every stakeholder. The client is a powerful, proximate, and influential stakeholder whose interests should be prioritized across all project phases irrespective of the chosen project delivery method. This is an expected result since the client, as project owner, usually plays a central role in all project phases. The same applies to project management entity and program managers, which was also anticipated considering its role in the project remains the same. In the case of project-related stakeholders, the characteristics, behaviors, interests, and level of influence of stakeholders differ among the selected project delivery methods. That its influence only concerns these types of stakeholders is expected since a project delivery method impacts how the procurement with each contracting party is managed (Kim & Kim, 2024). This, with the notion that this does not apply to the project management entity, which can also be a contracted party, the remaining role presented earlier explains this. In design and build projects, the architect and advisors are not considered powerful stakeholders, in contrast with projects with a design-bid-build or engineer-and-construct project delivery method. This is caused by a difference in contractual arrangements, wherein, in D&B projects, the architect and advisors are part of the contract the contractor has with the client, and in DBB and E&C projects, they have a direct contractual relationship. This gives this stakeholder higher levels of degree, betweenness, closeness, and eigenvector centrality, making it more powerful.

Furthermore, despite the same contractual arrangement, the architect and advisors in E&C projects are considered powerful in more phases (final design-completion phase) than in DBB projects. A possible explanation for this is that in case study C, which has a DBB as a project delivery method, it works with co-contractors instead of sub-contractors. As a consequence, making this stakeholder more important. Moreover, does the internal project manager have more responsibilities in the early phases (till engineering) of case study C than in case study A (E&C), making this stakeholder more powerful. This hypothesis may be true since when neglecting these two stakeholders in the data set, the architect and advisors would be powerful stakeholders in all these phases with the exception of the completion phase. Additionally, in E&C projects, the contractor is an influential stakeholder in the engineering till completion phase, while this does not apply in projects with a DBB or D&B as the project delivery method. This difference can be explained by the low levels of betweenness centrality in case studies B and C compared to case A. Which is caused by the bridging function the contractor plays between clusters in case study A, which is absent in case studies B and C. Furthermore, the interests of the contractor should be prioritized in the engineering till completion phase of E&C and DBB projects, whereas this does not apply to D&B projects. This is caused by lower levels of betweenness centrality, already explained above, as well as degree centrality. The lower levels of degree centrality are due to its score being relative to the maximum possible score, which is impacted by the higher number of stakeholders involved in these phases compared to case studies A and C. This discussion addresses subquestion three, which seeks to answer what the influence is of the project delivery method on the evolution of stakeholder networks during the project life cycle. As well as subquestion four, which seeks to identify the drivers of network changes.

The results also indicate a relationship between the different metrics used in this study. Wherein stakeholders showing a high degree of centrality are also likely to show high levels of betweenness, closeness, and eigenvector centrality. This relationship is the strongest among stakeholders with the highest level of degree centrality, where this weakens as the levels of degree centrality decrease. The relationship of eigenvector centrality with the other metrics is the least strong, with the most exceptions of a relationship in the dataset. The relationship between the three centrality metrics of degree, betweenness, and closeness centrality is also observed in the literature (Halder, 2024). The analysis further reveals a negative modularity score in the engineering phase of case study A, which uses an engineer-and-construct project delivery method. This finding was unexpected as it was anticipated that at each stage of the project the network could be properly divided into clusters. Since various sources in the literature mention that stakeholder networks can be divided into several subgroups (Lin & Wu, 2021; Wang et al., 2019; Xue et al., 2023). A possible explanation for a negative modularity score at this stage of the project was one highly connected core of stakeholders alongside three peripheral stakeholders. This structure suggests the lack of a community structure, which aligns with the negative modularity score (Newman, 2004b).

The division of networks into clusters also revealed the presence of bridges connecting them. Bridges refer to the parties that serve as the sole link connecting two otherwise separate clusters (Burt, 1992). In all case studies, the client serves as a bridge during the whole project life cycle; however, the specific connections differ. In case study A, the client links the public financier, supervisory board with the project-related stakeholders until completion, after which the role is limited to the public financier. In case study B, the client, together with the program managers, connects the performance and financial managers with other project-related stakeholders. From the preliminary design phase onward, they also serve as a bridge between the future users (via the communication experts) and the broader network. In case study C, the client has a bridging function between surrounding companies, governmental agencies (e.g., municipality), and the rest of the network. While also providing a bridging position for the shareholder and supervisory board in the initiative and the engineering phase.

The internal project management entity also holds a bridging position across all case studies, but at different project stages. In case study A, it serves as a bridge during the whole project life cycle with the exception of the engineering phase, connecting internal departments (e.g., internal experts), local residents, and the current building owner to the client. In case study B, it links the project leader ICT and facility management with the rest of the network from the engineering phase onward. In case study C, it connects internal experts and the internal plan team with the rest of the network throughout the project life cycle. This also applies to the concept team until the construction phase. Additionally, in the construction and completion phase, it links the supervisor execution and other project-related stakeholders.

Moreover, case study A showed the bridging function of the contractor from the construction phase onwards, linking the client and project management entity with the subcontractors. Typically this would also apply to DBB projects; however, in case study C, co-contractors are used instead of sub-contractors, resulting in the elimination of this bridge. In case study B, where a D&B procurement approach is used, this bridge logically does not occur, as the construction company is contracted as one single party, even if composed of multiple firms.

6.2 Comparison with the literature

In this section are the findings of each of the considered Stakeholder Assessment Success Factors (SAFs) compared with the literature to identify contradictions and confirmations for earlier made statements. This comparison is based on the findings of the literature review presented in section two, with the exception of program managers. As this was not part of the literature review, additional literature was sought.

The literature review previously concluded that gaining a comprehensive understanding of stakeholder networks requires a combination of the three levels of analysis: micro, meso, and macro. The study findings confirm this by demonstrating that each level provides valuable insights relevant to Stakeholder Assessment Success Factors (SAFs). The micro level assists in assessing stakeholder attributes and behaviors and predicting their influence, thereby capturing three out of five identified SASFs. The meso level enabled the identification of clusters and highlighted bridges within the network structure, thereby capturing one SASF. Finally, the macro level helps in understanding the interests connectedness, capturing the remaining SASF.

SASF 1 - Assessing attributes of stakeholders

The results confirm previous research findings in regards to the client being a key stakeholder across the design phases and construction phase (H. Lin et al., 2024; Tang et al., 2020; Y. Wang et al., 2022; H. Xue et al., 2023). In contrast, the findings contradict the statement that the client only holds the most central position in the project scope/feasibility stage (Loosemore et al., 2020), which can be considered the initiative phase in this study. Since in all case studies the client also scored highest on the centrality index in the engineering and construction phases. Moreover, there is no direct confirmation in the literature of the importance of the client in the initiative and completion phases of the project, as discovered in this study. In the case of the architect and advisors, the literature supports the finding that they are powerful stakeholders from the design phase to completion (Y. Wang et al., 2020; W. Wu et al., 2020; Zheng et al., 2024). However, the findings of this study contradict the previously made claim that during the construction phase, advisors have a higher betweenness centrality than project managers do (Q. Li et al., 2021). As the research findings show, the opposite is true. While the literature emphasizes the architect and advisors as a powerful stakeholders from design to completion, that in design-bid-build projects this only applies to the preliminary design phase cannot be directly validated in the literature.

Additionally, no confirmation can be found that architects and advisors are less powerful and nearby stakeholders in D&B projects compared to projects with DBB or E&C as project delivery methods, as observed in this study. In contrast, the research findings confirm that the contractor is a powerful and proximate stakeholder from the engineering to the construction phase, as it is considered a main player/primary stakeholder in these phases (Tang et al., 2020; Zheng et al., 2024). For the completion phase, no direct endorsement can be found in the literature, as discovered in this study. However, as the literature highlights that the contractor is a powerful and proximate stakeholder in the construction phase and being a contract party of the client, it indirectly supports the research findings. That in design-bid-build projects, the contractor is not a proximate stakeholder in the engineering phase cannot be verified by the literature.

The literature supports the importance of the project management entity across all project phases as found in this study (Badi et al., 2022; Loosemore et al., 2020). In contrast to statements in the literature, this stakeholder holds the most central position in several phases, rather than only during the project scope/feasibility stage (Loosemore et al., 2020). However, it does not hold this position in all phases, contradicting previous findings (Q. Li et al., 2021).

Finally, the literature also supports the importance of program managers. Since it highlights their responsibility for the program's overall management, planning, and delivery. Focusing on the delivery form of the program at the beginning and ensuring the intended outcomes are reached during implementation. Whereas the technical elaboration of the design is not considered a primary role of the program manager (Project Management Institute, 2024). This aligns with the research findings that the program manager is a powerful stakeholder during the whole project with the exception of the engineering. The same applies to the finding that the program manager is a proximate stakeholder during the initiative and preliminary design phase, since this stakeholder has an important role at the beginning of the project according to the literature.

SASF 2 - Assessing stakeholders' behaviors

The study finding that the nodes and ties change as the project progresses is supported by the literature. However, some papers mention that stakeholders are constantly joining and leaving the network at different points in time (H. Lin et al., 2024; Y. Wang et al., 2022). Whereas others claim this happens occasionally and not constantly (Dadpour et al., 2019). The results of this study show constant changes in terms of stakeholders compared to previous phase, confirming this statement. This is with the notion that in case study C, the total number of nodes is the same in the construction and completion phases. Yet the stakeholders involved change. In terms of stakeholder relationships, previous research concluded that they also constantly change (H. Lin et al., 2024). This study endorses this claim, as the number of ties changes after each stage.

The comparison of the research findings in terms of degree centrality is hard due to the lack of research on this topic. The finding that the degree centrality of the client peaks in the construction phase of case study C confirms a previous claim in the literature (D. Wang et al., 2023). However, contradicting that it peaks at the start of the project or the engineering phase. But this is with the notion that the engineering phase is not used as a distinct phase in this paper, and no project delivery method was specified. Moreover, the point in time that the degree centrality of the project manager peaks cannot be directly confirmed or contradicted by previous findings. Nevertheless, the supervisor company, which has similar responsibilities as a project manager, shows the highest degree centrality in the construction and completion phase (D. Wang et al., 2023). As a consequence, the research findings confirm high levels of degree centrality in these two phases. But contradicts, the finding of case study B in which the degree centrality of the project manager already peaks in the initiative phase. However, this is with the notion in the case study a design-and-build as the project delivery method is used. Whereas in this paper no project delivery method is specified.

The study findings in terms of how the degree centrality of the architect and advisors progresses partly contradict and confirm previous research. The highest levels of degree centrality of this stakeholder in the engineering phase of case studies A and C support previously made claims in the literature (Y. Wang et al., 2020). This with the notion that it is assumed that the technical elaboration (engineering) is part of the specified final detailed design phase of the paper, despite being not explicitly mentioned. In addition, the results of case study B confirm previous claims in the literature about the advisors showing the highest levels of degree centrality in the initiative phase. However, the findings contradict claims that the architect shows the highest levels of degree centrality in the construction phase (D. Wang et al., 2023).

Finally, for the contractor, the study findings confirm earlier made statement in the literature, claiming this stakeholder shows the highest levels of degree centrality in the preliminary preparation stage and construction and implementation phase (Zheng et al., 2024). Thereby providing conformation for high levels of degree centrality of the contractor in the final design phase and engineering phase, which can be seen as part of the preliminary preparation stage and the completion phase, which is mentioned in this paper as the implementation phase. However, the difference of peak in terms of degree centrality in relation to the chosen project delivery method cannot be found.

SASF 3 - Analyzing conflicts and coalitions amongst stakeholders

The research finding that the client and internal project manager form a cluster at each project stage supports earlier claims made in the literature (Zheng et al., 2024). However, this is with the notion that not specifically the internal project manager is mentioned and a different phasing is used. Additional endorsement can be found in the literature specifically for the client (Y. Wang et al., 2020). This study also showed that stakeholders grouped according to their role in the project, thereby confirming earlier claims in the literature (Li et al., 2020; Lin & Wu, 2021; S. Wang et al., 2019; Xue et al., 2023).

In contrast, this study contradicts earlier findings that primary stakeholders group together in small cliques (Zheng et al., 2024). As in this study, clusters consisting of primary and secondary stakeholders are also formed.

Additionally, it was identified that stakeholder networks consist of a well-connected core and a number of peripheral stakeholders at all stages, endorsing earlier research findings (Alhassan, 2024; H. Xue et al., 2023). In these networks, instructions are not necessarily given from the central to the peripheral stakeholder, which contradicts these claims in the literature (Alhassan, 2024; H. Xue et al., 2023). Since governmental stakeholders have substantial influence on the project, especially in the early stages of the project, despite their peripheral position in the network. Which can be seen in the initiative phase of case study C, supporting this contradicting view (Zhuang et al., 2019).

SASF 4 - Understanding areas of stakeholders' interests

The results regarding in which project phase the network exhibits low and high density and the influence of the chosen project delivery method on it are difficult to compare with previous findings. This is caused by the lack of studies considering this topic; nevertheless, some papers discuss density levels without the notion of the used project delivery method. Case study B showed the highest density levels at the beginning of the project, endorsing earlier claims (Y. Wang et al., 2022; Zheng et al., 2024). However, this notion only happens in design-and-build projects.

Case study C, on the other hand, showed the highest density levels at the completion phase, confirming earlier claims (Y. Wang et al., 2020). But once again, the notion that this only applies to design-bid-build projects. Furthermore, the results of this thesis contradict statements in the literature about the U-shaped development of density levels in a project (Tang et al., 2020; Y. Wang et al., 2022; Zheng et al., 2024). A possible explanation for this contradiction is that current research has a lower level of detail by usually only considering three or four project phases. Whereas, in this study, six project phases were distinguished. The results of case study C confirm previously observed results that density is higher in later stages than in early stages (D. Wang et al., 2023). In contrast, in case studies A and B, this cannot be observed. In addition, the results contradict the statement that network density increases until the tender period, after which it decreases (Y. Wang et al., 2020).

This study also showed that the interests of the client should be prioritized in all project phases, endorsing the claim that this should be done in the construction phase (Q. Li et al., 2021). No validation can be found in the literature for high levels of betweenness or degree centrality of the client in one of the other phases. However, as there is wide consensus in the literature about the importance of the client in all phases, the literature indirectly support the finding that the interests of the client should be prioritized throughout all phases. Moreover, no validation can be found for the project management entity or program manager showing high levels of betweenness or degree centrality during one of the used phases in this thesis.

Nevertheless, the literature supports the importance of the project management entity in all phases and also for program managers, except for the engineering phase. This is consistent with the results of this study.

In the case of the contractor, interests should be prioritized in the engineering till completion phase, which corresponds with the literature (Zheng et al., 2024). Additionally, the contractor showed limited levels of betweenness centrality in these earlier mentioned phases of case studies B and C, confirming previously published research findings (Zheng et al., 2024). But it is contradicted by the results of case study A, showing high results of betweenness centrality from engineering till completion. Suggesting that the project delivery influences the betweenness centrality of the contractor. Finally, this study found that the interests of the architect and advisors should be prioritized from preliminary design till the engineering phase, confirming earlier findings in the literature (Y. Wang et al., 2020). However, that this only applies to engineer-and-construct projects cannot be validated, since the project delivery method is not specified. Moreover, earlier conducted research claims that the architect and advisors show the highest levels of degree and betweenness centrality in the construction phase literature (Y. Wang et al., 2020). The results of this thesis contradict this claim.

SASF 5 - Predicting the influence of stakeholders accurately

The results show that the client is an influential stakeholder in the construction phase, confirming previously made claims in the literature (H. Lin et al., 2024; Y. Wang et al., 2022). In contrast, this study concluded that the client is also an influential stakeholder in the rest of the project; validation for this statement cannot be found in the literature. However, since the literature largely supports the claim that the client is an important stakeholder across all project phases, it indirectly support this finding. The same applies to the project management entity and program manager as influential stakeholders, as the literature endorses the importance of both stakeholders in all project phases. This is with the notion that no clear validation is provided for the engineering phase of the program managers.

The lack of direct comparison within the literature does also apply to the architect and advisors. This type of stakeholder is being found an influential stakeholder in the preliminary design till engineering phase of engineer-and-construct projects. Nevertheless, the literature supports that the architect and advisors are powerful stakeholders in these phases; for this reason, it is assumed that they then have at least some influence in these phases. However, no direct validation can be found that this only applies to engineer-and-construct projects as observed in this study. Finally, it was found that the contractor is an influential stakeholder from engineering till completion in engineer-and-construct projects. Confirming earlier claims that the contractor is one of the most influential stakeholders in the construction phase (H. Lin et al., 2024; Y. Wang et al., 2022). Validation that the contractor is also an influential stakeholder in the engineering and completion phase of the project cannot be found.

However, since the literature supports that the contractor is a powerful stakeholder from the engineering phase to completion, it can be assumed that this stakeholder is also influential during these phases. In contrast, no direct validation can be found that this only applies to engineer-and-construct projects as observed in this study.

In conclusion, the research findings both confirm and contradict a number of claims in the current state of the art, providing validation and new insights into stakeholder dynamics. However, the lack of construction-based SNA research regarding the influence of the project delivery method made it difficult to compare a number of research findings. Moreover, the literature lacks comprehensive insights into stakeholder influence at different phases, resulting in no direct validation of these research findings. Nevertheless, these insights provide a valuable basis for further research.

6.3 Research methods and limitations

The chosen research methodology was considered “tried and tested” at the start of this study because of the previous application of the chosen methodology in this context. As a result, it was stated that high reliance on the results could be placed. Reflecting back on this statement, it can indeed be argued that this chosen method is a “tried and tested” method, as it was well suited for the goals of this study. The combination of project documentation and multiple interviews enabled data triangulation, thereby increasing its validity. In addition, starting with the project documentation allowed for more specific questions during the interviews and validation of the earlier-made analysis. Furthermore, SNA's proven theoretical framework, including the metrics and their integration into the utilized software, enabled quick and automated calculation of the metrics, limiting manual intervention. Moreover, the study showcased that SNA was able to address five of the six Stakeholder Assessment Success Factors (SASFs), demonstrating the strength of this method in assessing the wider stakeholder network. Nevertheless, SNA is mainly suitable for research purposes due its time-consuming character of the analysis and the required expertise to be able to interpret the data. Thereby, limiting the practical applicability in everyday project management practices of this method.

Before the start of the research, two key challenges were also identified. The first one is data completeness; to tackle this key challenge, combining the insights from the project documentation analysis and interviews was selected to tackle this key challenge. By utilizing multiple data sources, the data could, as earlier mentioned, be triangulated, which increases the likelihood of data completeness. The second identified key challenge was the generalizability of the research findings; this was tried to be increased by careful selection of the case studies. Despite these efforts, the generalizability of the findings is still limited. Which is mainly because of the limited sample size, by only having one case study for each project delivery method due to the limited time in which this study was conducted. The limited sample size can be considered the first limitation of this study.

Another limitation is the differences between the case studies, which limit the validity of the comparison and the following conclusions on the influence of the chosen project delivery method. The differences between the case studies were reduced as much as possible in advance by establishing a set of selection criteria, including core similarities. Nevertheless, differences in terms of project context cannot be fully prevented, resulting in a different set of stakeholders. To limit the differences in types of stakeholders while not neglecting the specific project context, a set of core stakeholders has been established. This is with the addition of renaming to improve the comparison. The most striking difference in terms of project context is that case study B is part of a larger program, which does not apply to case studies A and C. The main difference that it brings is the program manager as a stakeholder. Which has been seen as an influential factor for the importance of the project management entity and the contractor.

This has been identified by neglecting the program manager in the dataset. However, one of the case studies being a program can also be considered a strength since it provides knowledge on stakeholder dynamics in program-based projects. Moreover, the use of undirected networks can also be considered a limitation of this study. As it assumes a two-way interaction between stakeholders, thereby neglecting the direction of relationships. This limitation is especially relevant for communication relationships, where a distinction between receivers and senders of information would provide additional depth to the analysis. This can be achieved by using directed networks. The final limitation of this study is that not all identified Stakeholder Assessment Success Factors (SASFs) in the literature review are addressed, since only aspects that directly could be captured using SNA metrics are taken into account. As a consequence, dynamics in terms of the attributes of urgency, stakeholder interests, and strengths and weaknesses are not considered in this research.

6.4 Practical and theoretical implications

These findings have theoretical as well as practical implications. The theoretical consequence is providing insights into how stakeholder networks evolve over the project life cycle and the factors driving these changes. These insights validate or challenge the current state-of-the-art, contributing to its advancement. Moreover, providing insights into the influence of the utilized project delivery method on the evolution of stakeholder networks, addressing a research gap. The practical implications of the findings are, first, the need for a shift from the traditional static approach to dynamic stakeholder management. This shift would enhance stakeholder management by better addressing the dynamic character of stakeholder networks observed in this study. This approach would include continuously going through the six stages of the stakeholder management process concluded in the literature review, which include stakeholder identification, analysis, classification, prioritization, engagement, and monitoring. However, after stakeholder identification, this process should be expanded with two additional stages: relationship identification followed by network visualization. Importantly, these steps can be integrated without requiring a full SNA implementation in terms of detailed metrics-based analysis, ensuring practical applicability in stakeholder management.

Relationship identification addresses the limitation of current stakeholder management tools, neglecting the broader stakeholder network. While network visualization enhances stakeholder management by providing a clear representation of the stakeholder network, simplifying complex social networks. These visualizations allow for quick insights into the position of stakeholders in the network and how they are interrelated. Additionally, these visualizations can also be used as a communication tool towards other stakeholders. The network visualizations should distinguish different types of relationships, as this study shows that each stakeholder is interrelated in different ways. Categorizing stakeholder relationships enhances understanding and facilitates enhanced stakeholder management. The four relationship types used in this study can be used as a basis, distinguishing between contractual, hierarchical, reciprocal interest, and communication relationships.

In addition, the result shows the need for tracking any changes in the type of relationship between stakeholders. As these changes may indicate, the need for adjustments in the stakeholder management approach. Moreover, the results showed clear cluster formation at each stage of the project. This knowledge can enhance stakeholder management as it allows the implementation of a distinct approach for each type of stakeholder group. For instance, a group consisting of designers and advisors requires a different stakeholder management strategy compared to a cluster of governmental agencies, as they have different roles in the project. Furthermore, the division of the network into clusters reveals which parties act as bridges between them. These parties may operate as "middlemen", resulting in a powerful position within the network (Otte & Rousseau, 2002). Consequently, emphasis should be placed on these stakeholders, leading to better management of key relationships.

The results indicate that at each stage of the project, the focus should be placed on a different set of stakeholders, requiring a different approach according to the selected project delivery method. To effectively manage these dynamics, a dynamic stakeholder management framework is proposed (see Appendix G), with a specific focus on key stakeholders whose engagement is particularly important (Ebekozi et al., 2024). A stakeholder is considered key if they are powerful, proximate, influential, or if their interests must be prioritized. The framework focuses on stakeholders who are generally part of a project rather than context-specific with the exception of the program manager. Powerful stakeholders require a stakeholder management strategy that emphasizes proactive communication to ensure project objectives are reached while also enabling the early identification of potential conflicts, which can harm the project outcomes. While proximate stakeholders require high levels of stakeholder engagement. On the other hand, stakeholders who are less proximate, despite being key stakeholders, do not require constant communication but should be involved in key decisions to ensure their perspectives are considered. Moreover, the interests of a number of stakeholders should be prioritized. To be able to adequately address them, a clear understanding of their interests in the project is, first of all, needed. Finally, some of the key stakeholders have significant influence on the project; their influence can be leveraged to contribute to the project objectives. Whereas any concerns of these stakeholders should be addressed to prevent them from negatively influencing the project.

Comparing the earlier identified bridges with these key stakeholders reveals that the client, project management entity, program manager, and contractor are both key stakeholders and bridges. This highlights that when a stakeholder serves as a bridge in the network, they can also be considered a key stakeholder. However, the opposite is not necessarily true. For instance, in case studies A and C, the architect and advisors are considered key stakeholders but do not have a bridging position. Moreover, a key stakeholder may not function as a bridge in all project phases, as observed in case study A, wherein the project management entity is a key stakeholder during the engineering phase but does not act as a bridge during that phase. Overall, the findings highlight the power of identifying bridges within the network, which can be done visually in a manual way.

On the basis of the analysis, input can also be provided for the development of an optimal stakeholder network structure as part of the broader stakeholder management strategy, enhancing stakeholder management. First of all, the network structure should be clearly divided into different clusters, where each cluster consists of stakeholders with similar roles. For instance, a cluster consisting of the internal experts. These clusters ensure that stakeholders with shared responsibilities are closely connected. Additionally, these clusters should be connected via clear bridges, which facilitates the coordination and communication between the separate clusters. These bridging responsibilities should be taken by the stakeholders who are central in the network, which should be the client, project management entity, and the program manager in the case the project is part of a wider program. These three central stakeholders should form together the core cluster. Furthermore, it is crucial that direct communication relationships are formed between powerful and influential stakeholders, as well as those who share reciprocal interests. The meeting structure should adapt to this. Finally, a clear hierarchical structure should be present, outlining who reports to whom and defining authority in the project. This discussion addresses sub-question five.

6.5 Importance of research findings

The findings create an enhanced understanding of stakeholder dynamics in construction projects and the influence of project delivery methods on them. These findings are important as they contribute to the establishment of more effective stakeholder management strategies, which are able to analyze stakeholder dynamics and manage them. To this end, a first effort has been made in this study, including the development of an optimal stakeholder network structure as part of this strategy. The lack of effective strategies negatively influences stakeholder management performance, which negatively impacts project outcomes (Oppong et al., 2017; R. J. Yang & Shen, 2015). So in conclusion, enhancement of stakeholder management strategies would ultimately lead to enhanced project outcomes. These hinge into the larger issue of common project failure in the construction industry (Oppong et al., 2017). The importance of stakeholder management in the daily work of project managers was emphasized by all interviewees in this study and by some as an integral part of project management. Thereby confirming the proposition that stakeholder management can be seen as an important aspect of project management (Assudani & Kloppenborg, 2010; Chung & Crawford, 2016; Srinivasan & Dhivya, 2020).

7. Conclusion

7.1 Scientific relevance

This study examined the evolution of stakeholder networks over the life cycle of construction projects with different procurement approaches through a longitudinal SNA study. This is with the primary objective of increasing our understanding of the effect of the chosen procurement approach on stakeholder dynamics. This is with the ultimate goal of improving stakeholder management throughout the project life cycle, leading to enhanced project outcomes. To this end, a central main question and a number of sub-questions were established. The central main question is the following:

"How do stakeholder networks of different procurement approaches evolve during the life cycle of a construction project using Social Network Analysis (SNA), and how can these insights be used for enhanced stakeholder management?"

This main question is supported by the following sub-questions:

- SQ1: What is the current state-of-the-art knowledge on stakeholder management, stakeholder dynamics, and the integration of SNA into stakeholder management?
- SQ 2: How do stakeholder network structures of different procurement approaches evolve during the life cycle of a construction project using SNA?
- SQ 3: How does the evolution of stakeholder network structures of different procurement approaches compare?
- SQ 4: What are the factors that drive the changes in the network structure?
- SQ 5: How can the insights from the SNA be applied to enhance stakeholder management in construction projects?

Each of these sub-questions also has its own objective supporting the earlier mentioned primary objective of this study. The first sub-question aims to review the state-of-the-art knowledge on stakeholder management, stakeholder dynamics, and the integration of SNA into stakeholder management. This was addressed through a systematic literature review on the last five years of published papers. From this review, it can be concluded that stakeholder management consists of six distinct stages: identification, analysis, classification, prioritization, engagement, and monitoring. In this process, six Stakeholder Assessment SFs (SASFs) are considered Critical Success Factors (CSFs). Although existing stakeholder analysis tools provide guidelines for assessing the importance of stakeholders, they are considered inadequate because they ignore the interrelationships between stakeholders. SNA makes up for this limitation by providing a thorough quantitative analysis of the stakeholder connections within the network. SNA and traditional stakeholder typology models can thus be considered complementary. The literature also identifies three types of stakeholder dynamics that are present in stakeholder networks, namely involved stakeholders, stakeholder relationships, and changes of attributes and characteristics of stakeholders. Additionally, a comprehensive theoretical basis for integrating SNA into stakeholder management is present, along with mathematical metrics for analysis at each of the three analysis levels: micro, meso, and macro.

According to the literature, gaining a comprehensive understanding of stakeholder networks requires a multi-level approach, integrating all three levels of analysis. The study findings confirm this by showing that each level provides distinct and valuable insights, collectively addressing five out of six SASFs, with the exception of determining the strengths and weaknesses of stakeholders. Thereby, demonstrating the strength of this method of assessing the wider stakeholder network. However, SNA remains primarily suitable for research purposes due its time-consuming nature and the expertise required to interpret its results. Consequently, its practical applicability in daily project management practices is limited.

The aims of the second and third sub-questions are interrelated, as they both investigate how stakeholder network structures evolve across different procurement approaches during the project life cycle. Specifically, the third sub-question aims to identify similarities and differences in the evolutionary patterns between these approaches. Both objectives were addressed through a longitudinal SNA study of three case studies, each employing a different project delivery method as part of their procurement approach: D&B, E&C, and DBB. It can be concluded that, irrespective of the chosen procurement approach, stakeholder networks are dynamic, exhibiting changes in terms of stakeholders, relationships, attributes, behaviors, interests, level of influence, and the overall network structure. In which relationship dynamics encompass not only the formation of new relationships and the removal of old ones, but also changes in relationship types and thus their strength. Project managers in the field are partly aware of these dynamics, recognizing stakeholder, behavioral, and interest-related dynamics, with the strongest awareness of stakeholder changes. However, awareness of changes in attributes, relationships, level of influence, and overall network structure is lacking. In this study, stakeholder attributes refer to power (the capacity to establish dependencies, manage resources, and prioritize certain interests) and proximity (the degree to which stakeholders are directly involved in the project). Stakeholder behavior is reflected in degree centrality, indicating the number of direct connections a stakeholder has.

The comparison of the network structures and their evolutionary pattern between procurement approaches reveals notable differences and similarities. Irrespective of the chosen procurement approach, the client, project management entity, and program manager are key stakeholders from the initiative till the completion phase. The same holds for the contractor from the engineering till the completion phase. On the other hand, in DBB and E&C projects, the architect and advisors are considered key stakeholders in the preliminary design to completion phase and not in D&B projects because of the difference in contractual arrangements. In this study, a stakeholder is considered key if they are powerful, proximate, influential, or if their interests must be prioritized. Moreover, it can be concluded that stakeholders with interconnected roles form clusters across all phases. Hereby, clusters form around the client and the internal project management entity in all phases, indicating their consistent central role. Both occur irrespective of the chosen procurement approach. Additionally, the density levels also differ between the procurement approaches, indicating also differences in interest connectedness. E&C projects show the highest density levels at the engineering phase, D&B at the initiative phase, and DBB projects at the completion phase.

The goal of the fourth sub-question is to identify and analyze the factors that contribute to stakeholder network changes across the different phases of a construction project. This objective was addressed through interviews and the conducted SNA. It can be concluded that the procurement approach is a primary driver behind all aspects of stakeholder dynamics except relationship changes. Additionally, procurement-related dynamics only affect project-related stakeholders, whereas the client, project management entity, and program manager in the case the project is part of a wider program remain stable throughout the process. Relationship changes is driven by the client's internal knowledge, the municipality's land ownership, and wishes by the client. Internal knowledge of the client also drives changes in terms of stakeholders. Additionally, stakeholder roles and responsibilities can also be considered a key driver, impacting both stakeholder involvement as well as network structures.

The final sub-question seeks to identify how the SNA results can enhance stakeholder management across the project life cycle. This objective was addressed in the discussion section, which concluded that, first of all, a shift from static to dynamic stakeholder management is necessary. Since the traditional static approach overlooks the observed stakeholder dynamics, it negatively impacts stakeholder management success. In contrast, adopting a dynamic approach effectively captures these stakeholder dynamics, contributing to more effective stakeholder management. The proposed dynamic approach involves reiterating the general stakeholder management process at the beginning of each project phase, with the addition of two phases: relationship identification and network visualization. These additional phases address the limitation of conventional methods that primarily focus on individual stakeholders neglecting the broader network. Importantly, these steps can be integrated without requiring a full SNA implementation in terms of detailed metrics-based analysis, ensuring practical applicability in stakeholder management.

Relationship identification captures changes in stakeholder relationships, highlighting the need for adjustments in the stakeholder management approach. Network visualization offers quick insights into stakeholder positions and clusters, enabling tailored approaches for each stakeholder group. For instance, designers and advisors require a different management approach than governmental agencies. Additionally, these network visualizations allow for the identification of bridges between clusters; emphasis should be placed on these parties due to their influential position. Moreover, the focus should shift to a different set of stakeholders at each stage of the project; the proposed framework in this study can be used for this. Indicating that the focus should be on the client, project management entity, and program manager from the initiative to the completion phase, and on the contractor from the engineering to the completion phase regardless of the procurement approach. Whereas focus should be placed on the architect and advisors in the preliminary design phase till the completion phase in DBB and E&C projects. Furthermore, the procurement approach affects how the architect, advisors, and contractor should be managed. For instance, in an E&C project, the architect and advisors are powerful stakeholders in the preliminary design phase, requiring proactive communication, while this is not true for DBB or D&B projects.

The findings show that while all bridging stakeholders are key stakeholders, the opposite is not necessarily true. The client, project management entity, program manager, and contractor serve as both, whereas the architect and advisors do not, despite being considered key stakeholders in case studies A and C. Additionally, a key stakeholder's bridging role may vary across project phases, as observed in case study A, wherein the project management entity is a key stakeholder during the engineering phase but does not act as a bridge during that phase. Overall, it can be concluded that bridge identification is crucial for identifying key stakeholders without the need for SNA metrics as it can be done visually. In addition to dynamic stakeholder management approach, an optimal stakeholder network structure enhances stakeholder management. This includes well-defined clusters of interconnected stakeholders, clear bridges managed by the central cluster (client, project management entity, and program manager if applicable), direct communication between powerful, influential, and reciprocally interested stakeholders, and a clear hierarchy to enhance communication and coordination.

In conclusion, the conducted Social Network Analysis (SNA) reveals that stakeholder networks exhibit stakeholder dynamics irrespective of the chosen procurement approach. The procurement approach influences dynamics in the case of all the observed aspects, with the exception of relationships. The findings highlight the need for dynamic stakeholder management, integrating relationship identification and network visualization, to enable a more tailored approach at each project stage, enhancing overall effectiveness. Additionally, establishing an optimal stakeholder network structure, with well-defined clusters, clear bridges, a central core, direct communication among key and reciprocally interested stakeholders, and a clear hierarchy, enhances communication and coordination, ultimately improving stakeholder management.

The results of this research are both scientifically and practically relevant. From a scientific perspective, this study addresses a significant research gap in the literature by performing a comparative longitudinal SNA study including different procurement approaches, providing a deeper understanding of stakeholder dynamics in building projects and the influence of the chosen procurement approach on this aspect within the European context. Moreover, this study incorporates all three levels of analysis (micro, meso, and macro), filling another research gap in the literature. The study findings also hold practical relevance as they lead to the development of enhanced stakeholder management strategies, which are currently lacking, by moving towards a dynamic stakeholder management approach as well as establishing an optimal stakeholder network structure. This ultimately leads to improved project outcomes, which is considered another issue in the construction industry.

An aspect that could have been improved was managing stakeholder differences across case studies. Despite efforts to group, rename, and establish a core set of stakeholders, significant variation still applies, negatively affecting the generalizability of the findings. A better approach would have been to identify a common set of stakeholders through a literature review and an initial round of interviews, followed by a second round to determine active phases and relationships of stakeholders.

This would have improved cross-case comparison and the generalizability of the findings. Additionally, the assessment of the program context on the results of case study B could have been improved. In this study, the impact was assessed by neglecting the program-specific stakeholders in the dataset. A better approach would have been to perform separate analyses, with and without the program-specific stakeholders, comparing the results to assess their influence on the results.

7.2 Societal relevance

The societal relevance of this research lies in the development of more effective stakeholder management strategies that are more responsive to stakeholder dynamics. This ensures the steady progress of projects during the project life cycle, leading to enhanced project outcomes in the construction industry. This is particularly important in the case of public projects, which are studied in this research, as they are funded by taxpayers money. Contributing to a more effective use of public resources. Moreover, an increased understanding of stakeholder dynamics and the stakeholder networks enhances stakeholder engagement, ensuring a diverse set of interests, including external stakeholders (e.g., local residents and businesses), are considered and addressed throughout the project life cycle.

7.3 Recommendations

To deepen our understanding of stakeholder dynamics and the influence of procurement approaches, future research is needed. First of all, this study's small data set limits the generalizability, so further research including more case studies is recommended to validate the findings. Moreover, this study focused on public projects, therefore further research including private projects is recommended to verify the applicability of the conclusions to private projects. Additionally, the practical implications of the results proposed in this study have not been tested in practice; future research is recommended to examine and assess its practical application. Furthermore, since 1 January 2024, the Environment and Planning Act has been active in the Netherlands. This new act stimulates the initiator (client) in all projects to involve local residents and businesses, while this is mandatory for projects that deviate from the applicable environmental plan (Rijksoverheid, 2023). As the considered case studies all had their environmental permit approved before this new law came into effect, the old regulations apply to these projects (Rijksoverheid, n.d.). This increased emphasis on public participation may affect stakeholder dynamics; future research is recommended to identify the impact of this new law. Finally, in this study the data extraction and analysis were performed manually, this is a time-consuming task, especially when moving towards dynamic stakeholder management as proposed in this study. Therefore, future research is recommended to investigate how this process, or parts of it, can be automated. Artificial intelligence, in particular, large language models (LLMs), offers a promising solution. The project management plan, created at the start of each project, can serve as the primary input for the model, containing most of the necessary information, except for the contractual relationships. Those could be added manually due to the sensitive content of the contacts. To enhance the identification of stakeholder dynamics, complementary documents, including meeting minutes and progress reports, can be utilized as input for the model.

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Appendix A – Interview protocol

According to Jacob and Furgerson (2015), an interview protocol can help researchers in the process of data collection. In addition to a list of interview questions, an interview protocol covers the procedural level of interviewing. For the development of the interview protocol, insights from three papers: Castillo-Montoya (2016), Jacob and Furgerson (2015) and Kallio et al. (2016) have been used. Before the interview is conducted, this interview protocol has been pilot tested. In this process, it is important that the interview protocol has been tested with participants that are similar to the sample that will be interviewed for the actual research (Maxwell, 2013). The participants of the interviews are the project managers of the selected case studies. Therefore, this interview protocol has been tested with another project manager of Brink. This pilot test led to reformulations and the addition of new interview questions. Following the final refinement of the interview protocol, an invitation to each of the interview participants was sent. This invitation included an introduction about the research topic and purpose of the interview. Moreover, did this invitation include a proposed formal date and time and a letter of informed consent that had to be signed before the interview would be conducted. Finally, all interviews were conducted in person and in Dutch.

Introduction

To all the interview participants, the following introduction in Dutch has been provided:

Dit interview zal worden uitgevoerd voor mijn afstudeeronderzoek van de master Construction Management and Engineering aan de TU Eindhoven. In dit onderzoek zal ik ingaan op het dynamische karakter van stakeholder netwerken in bouwprojecten. Waarbij een stakeholder netwerk gezien kan worden als een spinnenweb bestaande uit de betrokken stakeholders en hun onderlinge relaties. Uit de literatuur blijkt dat gedurende een bouwproject de betrokken stakeholders en hun onderlinge relaties veranderen. Dit betekent dat de belangrijkste stakeholders (bijvoorbeeld meest invloedrijk) verschillen per fase. Daarnaast blijkt uit onderzoek dat de gehanteerde bouworganisatievorm ook van grote invloed is op het stakeholder network. Om dit dynamische karakter van stakeholder netwerken voor verschillende bouworganisatie-vormen beter in kaart te brengen en hierbij bij te dragen aan een verbeterd stakeholder management, zal in deze studie deze stakeholder netwerken worden gevisualiseerd en geanalyseerd op meerdere punten in tijd middels Social Network Analysis (SNA). De hanteerde meetpunten in deze studie zijn de volgende: initiatief, voorlopig ontwerp, definitief ontwerp (uitvoeringsgereed), uitvoering en oplevering. De uitkomsten van dit interview zullen worden gebruikt voor het opstellen van het stakeholder netwerk en de daaropvolgende analyse voor ieder van deze vijf meetpunten. In het interview zal het gesprek (geen beeld) worden opgenomen en volledig worden geanoniseerd. De vragen zullen in het Nederlands gesteld worden en het totale interview zal circa 1 uur in beslag nemen.

Interview protocol

Introduction

Goedemorgen/goedemiddag, allereerst bedankt voor deelname aan dit interview. Dit interview wordt uitgevoerd in kader van mijn afstudeeronderzoek voor de studie Construction Management and Engineering aan de TU Eindhoven. In dit interview zal ingegaan worden op de veranderingen in betrokken stakeholders en de onderlinge relaties in de context van [case studie A, B of C]. Deze veranderingen worden ook wel stakeholder dynamics genoemd. Deze verkregen kennis zal gebruikt worden om het stakeholder management van toekomstige bouwprojecten te verbeteren. Stakeholder management kan gezien worden als een process bestaande uit zes fases: identificatie, analyse, classificatie, prioritisatie, het betrekken van stakeholders en monitoring. Ter voorbereiding van dit interview heb ik verstrekte project documentatie geanalyseerd. Waarop basis van ik een eerste inventarisatie heb gedaan in de betrokken stakeholders en hun onderlinge relaties. Deze resultaten zullen in het interview aan jou worden getoond. De stemmen in dit gesprek zal worden opgenomen via mijn telefoon die in vliegtuigmodus staat om onderbrekingen te voorkomen. Alle genoemde namen van personen dan wel bedrijven zullen worden geanonimiseerd doormiddel van codes, bijvoorbeeld aannemer A. Indien gewenst kan de transcriptie van dit gesprek worden gedeeld.

Check consent letter

Start recording

Zoals ik zojuist al aangaf zal dit interview worden uitgevoerd in kader van mijn afstudeerproject. In dit interview zal ik allereerst vragen stellen over jouw achtergrond, vervolgens zal ik ingaan op de betrokken stakeholders per fase. Tot slot zal ik vragen stellen over de onderlinge relaties tussen stakeholders en hoe deze veranderen gedurende het project. Naar verwachting zal dit interview circa 1 uur duren.

Zijn er nog vragen voordat we aan het interview beginnen?

Om te beginnen zou ik eerst wat vragen willen stellen over je ervaring en achtergrond.

- Wat je functie en ervaring?
 - Functie
 - Betrokken projecten: project type, publiek/privaat & nieuwbouw/renovatie
 - Betrokken fases
- In hoeverre speelt stakeholder management een rol binnen jou dagelijkse werkzaamheden?
- In hoeverre ben jij je bewust van het dynamische karakter van stakeholder netwerken tijdens de projecten waar je aan hebt gewerkt? En kan je voorbeelden geven van hoe dit dynamische aspect dan tot uiting kwam in jouw projecten?

Vervolgens zou ik graag wat vragen stellen over de betrokken stakeholders per fase van de geselecteerde case studie. Hiervoor heb ik voorafgaand aan dit interview de verstrekte project documentatie genanalyseerd en een eerste inventarisatie gedaan. Ik laat je nu de lijst van geïdentificeerde stakeholders zien.

- Welke stakeholder(s) mis je nog in deze lijst?
 - Welke interne stakeholder(s) mis je?
 - Welke externe stakeholder(s) mis je?
- Welke stakeholders waren er specifiek betrokken in de initiatief fase van het project?
- Welke stakeholders waren er specifiek betrokken in het voorlopig ontwerp van het project?
- Welke stakeholders waren er specifiek betrokken in het definitief ontwerp van het project?
- Welke stakeholders waren er specifiek betrokken in de uitvoering van het project?
- Welke stakeholders waren er specifiek betrokken bij de oplevering van het project?

Tot slot zou ik graag wat vragen stellen over de relaties tussen de zojuist genoemde stakeholders voor iedere fase. Hierbij maak ik onderscheidt tussen drie vormen van een stakeholder relatie: (1) de aanwezigheid van een contractuele relaties tussen beiden partijen; (2) de aanwezigheid van wederzijdse belangen dan wel hiërarchie (3) de mogelijkheid van directe communicatie tussen beiden partijen. Hiervoor heb ik voorafgaand aan dit interview de verstrekte project documentatie genanalyseerd en een eerste inventarisatie gedaan. Ik laat je nu de lijst van geïdentificeerde relaties zien.

- Welke relatie(s) tussen stakeholders mis je nog in deze lijst?
 - Welke contractuele relatie(s) mis je?
 - Welke hiërarchische relatie(s) mis je?
 - Welke relatie(s) met wederzijdse belangen mis je?
 - Welke communicatierelatie(s) mis je?
- Wat zijn de relaties tussen de stakeholders in de initiatief fase van het project? En welke vormen hebben deze stakeholderrelaties?
- Wat zijn de relaties tussen de stakeholders in de voorlopig ontwerp fase van het project? En welke vormen hebben deze stakeholderrelaties?
- Wat zijn de relaties tussen de stakeholders in de definitief ontwerp fase van het project? En welke vormen hebben deze stakeholderrelaties?
- Wat zijn de relaties tussen de stakeholders in de uitvoering van het project? En welke vormen hebben deze stakeholderrelaties?
- Wat zijn de relaties tussen de stakeholders bij de oplevering van het project van het project? En welke vormen hebben deze stakeholderrelaties?

Dit was mijn laatste vraag en brengt ons bij het einde van dit interview. Hierbij nogmaals bedankt voor je tijd en waardevolle input voor mijn onderzoek. Heb jij tot slot nog inzichten of opmerkingen die niet besproken zijn in dit interview, maar wel waardevol worden geacht? Of heb jij nog vragen over dit interview?

Stop recording

Appendix B – Transcriptions interview

This chapter presents the interview transcripts from each of the selected case studies. The transcripts are presented in Dutch, which is the language in which the interviews have been held. All the mentioned names of persons, companies, or projects have been anonymized for confidentiality reasons. Filler words like 'uh' and 'um' and all additional information that are not directly related to the asked question were removed from the transcription to ensure clarity and focus on the main content. This also applies for repeatings during the interview. In each of these interviews, Daan Dongelmans, the author of this study, is the interviewer.

Case study A

Interview project manager A

Interviewer: Goedemorgen nogmaals, zoals ik net al aangaf gaat het interview in op mijn afstudeerproject. Allereerst zal ik wat vragen stellen over jouw achtergrond. Daaropvolgende de stakeholders bij dit project en dan specifiek per fase. Tot slot zal ik wat vragen stellen over de onderlinge relaties tussen de stakeholders en tijdens welke fases deze relaties er zijn. Naar verwachting zal dit ongeveer 1 uur. Heb jij nog vragen voordat we beginnen?

Project manager A: Nee.

Interviewer: Zou je wat kunnen vertellen over je functie en ervaring?

Project manager A: Ik ben Project manager A van Brink en werk daar nou bijna 16 jaar. Heb eerst me vooral met project management bezig gehouden en de laatste jaren vooral met aanbesteden en contracteren. Maar het project waar het nu overgaat, daar was ik project manager en heb ik ook alle aanbestedingen begeleidt. En ik heb ook TU gedaan, CME ook dus dat is een beetje mijn achtergrond.

Interviewer: Zou je misschien ook wat kunnen vertellen over de type betrokken projecten, dus bijvoorbeeld zit je meer in de publieke sector, privaat, nieuwbouw, renovatie, etc.?

Project manager A: Dat is heel wisselend want ook bij case studie A was het renovatie, maar voor hogeschool A was het weer nieuwbouw. De aanbestedingen die ik nu krijg zijn eigenlijk allemaal ontwikkelingen van nieuwbouw locaties. Het is dus wisselend, ook op gebied van publiek en privaat dat loopt ook allemaal door elkaar.

Interviewer: Precies en qua betrokken fases, doorloop jij meestal een bepaalde fase van een project? Of zit jij gedurende het hele project aan tafel?

Project manager A: Bij case studie A zat ik dus het gehele proces aan tafel, vanaf de selectie van het ontwerpteam. Nu de laatste paar jaar, omdat ik nu eigenlijk vooral met aanbestedingen bezig ben, werk ik alleen maar aan de voorkant. Dus niet meer die realisatie fase.

Interviewer: In hoeverre speelt stakeholder management nou een rol binnen jouw dagelijkse werkzaamheden bij Brink? Hoe belangrijk is dat voor jou?

Project manager A: Ja dat is altijd belangrijk, want je hebt altijd te maken met stakeholders die je altijd hebt te managen. Zeker in grote complexe projecten als een campus of als nieuwbouw van een hogeschool locatie, daar zijn altijd stakeholders.

Interviewer: Ten derde, ik heb het over het dynamische karakter, de focus van mijn onderzoek. In hoeverre ben jij je tijdens jouw projecten bewust van dit dynamische karakter. Bij het dynamische karakter bedoel ik dat gedurende het project stakeholders bijkomen dan wel dat er relaties tussen stakeholders wisselen. En kan je daar misschien voorbeelden in geven als je dat hebt ondervonden in projecten?

Project manager A: Ja ik heb dat niet bewust ondervonden. Toen ik jouw vragenlijst zag en ik erover na aan het denken was dacht ik ooh ja, als je het zo zegt. Ik ben zelf meer relativerend en ga gewoon door met wat we aan het doen zijn. Dus ik ben misschien minder sensitief om iedere keer die stakeholders weer in je hoofd te houden, maar dat ligt denk ik ook aan mij.

Interviewer: Dan gaan we over naar het tweede deel van het interview, dat gaat in over de betrokken stakeholders en dan per fase van de geselecteerde case studie. Zoals ik aangaf heb ik voorafgaand aan het interview de verstrekte project documentatie geanalyseerd en op basis daarvan een eerste inventarisatie gedaan. En mijn vraag is welke stakeholders mis jij nog in deze lijst? En dit kan zowel een interne als een externe partij zijn.

Project manager A: Ik zou het college van bestuur en academiectoren als losse regel zien. Ja bij architect daar zou je architect en adviseurs van kunnen maken, want dat was gewoon een intergraal ontwerpteam.

Interviewer: Verder nog?

Project manager A: Ja die interne expert aanbesteding, daar zou je de afdeling inkoop van kunnen maken. Misschien mis je hier nog het project team, wij staan daar als project manager, maar er was natuurlijk een project team van de opdrachtgever. Dus op papier is het CVB opdrachtgever.

Interviewer: Daaropvolgende op deze lijst, is de vraag wanneer een bepaalde stakeholders nou betrokken was binnen dit project. Beginnende eigenlijk met de initiatief fase. Dus welke stakeholders zijn er betrokken vanaf de initiatief fase van dit project?

Project manager A: De raad van toezicht daar wordt natuurlijk altijd continue verantwoording aan afgelegd dus die zitten eigenlijk in elke fase. Het CVB natuurlijk wel, want dat is de stuurgroep waar je verantwoordingen aan aflegt.

De klankboordgroep ook, project team natuurlijk ook, wij (Brink) ook, de architect niet en de adviseurs ook niet. De aannemer niet, onderaannemers niet. Interne experts ook niet. Die aanbesteding, wel, congregatie ook.

Interviewer: Daaropvolgende het voorlopig ontwerp, raad van toezicht natuurlijk betrokken geweest? Ditzelfde geldt denk ik ook voor opdrachtgever, academiedirecteuren, en klankboordgroep?

Project manager A: Ja en dan komt S5, die komen natuurlijk wel allemaal (architect + adviseurs). De interne experts ook, aanbesteding niet. Congregatie ook niet, die studenten wel. Gemeente dat is moeilijk, want daar heeft de opdrachtgever A wel op het moment dat zij dit plan hadden, hebben zij natuurlijk de gemeente geïnformeerd. Dus misschien dat die gemeente toch wel in alle fases. Andere HBO-instellingen in Nederland geen idee. Die ook (andere onderwijsinstellingen in de gemeente) en samenwerkingpartners die weet ik ook niet. Lokale bevolking wel, datzelfde geldt voor de gemeente die zijn ook één keer in de zoveel tijd geïnformeerd. Zeker toen het ontwerp wat meer vorm kreeg, dus ik denk vanaf het definitief ontwerp meer en in de uitvoering zeker en bij de oplevering ook. De lokale bevolking vind ik eerlijk gezegd niet de goede term, ik zou eerder omwonenden zeggen.

Interviewer: Dan verwacht ik dus de raad van toezicht ook tijdens het definitief ontwerp? Hetzelfde geldt voor opdrachtgever en academiedirecteuren?

Project manager A: Ja. Ja die allemaal (CVB- architect en adviseurs).

Interviewer: De aannemer kwam er dan wel al bij, bij het definitief ontwerp?

Project manager A: Na het definitief ontwerp.

Interviewer: Ik bedoel eigenlijk met definitief ontwerp, uitvoeringsgereed dus dan moet het zegmaar ook technisch uitgewerkt zijn.

Project manager A: Want eigenlijk zitten daar nog fases tussen want je hebt een voorlopig ontwerp, definitief ontwerp, technisch ontwerp en dan heb je nog een uitvoeringsgereed ontwerp en dan heb je uitvoering in een traditioneel proces. Wij hadden hier een geïntegreerd proces dus tot en met het definitief ontwerp heeft het ontwerpsteam dat gemaakt en toen hebben we aanbesteed en toen heeft de aannemer de technische uitwerking gedaan. Die zou je eigenlijk daar tussen moeten zetten, na het definitief ontwerp. Dus na het definitief ontwerp zou je eigenlijk nog een kollometje engineering kunnen invoegen.

Interviewer: Dat geldt ook voor de onderaannemers?

Project manager A: Ja voor de onderaannemers ook en die interne experts die zijn in het definitief ontwerp ook nog wel betrokken geweest waarschijnlijk.

De congregatie, is de projectmanager van de opdrachtgever bij wijze van spreken maandelijks een kopje thee gaan drinken om gewoon een goede relatie te behouden. Studenten en docenten zaten natuurlijk ook in de definitief fase. Dan bij de engineering waren zij niet betrokken, bij de uitvoering?

Interviewer: Misschien wat updates en communicatie?

Project manager A: Ja dat, oplevering niet. De gemeente in het definitief ontwerp, in de engineering niet, uitvoering wel want dan hebben zij ook een rol in de bouwtoets. In de oplevering, de daadwerkelijke oplevering natuurlijk niet, want dat is gewoon tussen de aannemer en de opdrachtgever. Maar in die laatste fase voor oplevering, hebben wij veel met de gemeente rondgelopen in het kader van brandveiligheid.

Interviewer: Dan hebben we eigenlijk al deze partijen ook gewoon door. Dus raad van toezicht, engineering ook? In principe wel gedurende het hele proces?

Project manager A: Ja omdat zij in de zoveel tijd werden geüpdate. De uitvoering en oplevering ook. De oplevering misschien niet helemaal. Het CVB wel. Dat moet je bij de engineering, uitvoering en de oplevering ook. Klankbordgroep die zou ik daar niet zetten. Project team wel en oplevering ook. De project manager ook, eigenlijk al die adviseurs. De aannemer. Interne experts niet.

Interviewer: Dan het laatste deel, dat gaat dan in over de relaties tussen de stakeholders. Daarvoor heb ik ook een eerste inventarisatie gedaan voor de verschillende relaties die ik voorzie. Daarbij maar ik onderscheid tussen drie vormen van een relatie. [Verdere uitleg gegeven].Allereerst de vraag of jij zou willen kijken naar deze eerste inventarisatie en of jij kan aangeven of jij bepaalde relaties mist dan wel relaties die kloppen eigenlijk niet. Beginnende met de contractuele relaties. Ik voorzie dan contractuele relaties tussen de opdrachtgever en dan project manager, de opdrachtgever en de architect. De opdrachtgever en de aannemer en de opdrachtgever en de congregatie. Ten slotte een contract tussen de aannemer en de onderaannemers.

Project manager A: Ja.

Interviewer: Daaropvolgende de wederzijdse belangen danwel hiërarchie. Ik voorzie hiërarchie tussen het college van bestuur en raad van toezicht. En dan tussen de opdrachtgever en de gemeente, omdat de gemeente de omgevingsvergunning verleend.

Project manager A: Ja en tussen het CVB en het project team.

Interviewer: Daaropvolgende de wederzijdse belangen, tussen de project manager en de aannemer. Project manager en de architect. De architect en de aannemer.

De klankboordgroep en project manager. De project manager of de opdrachtgever, daar was ik niet helemaal zeker van hoe die koppeling naar die interne experts verliep.

Project manager A: Dat is eigenlijk het project team. De klankboordgroep academies die hebben natuurlijk ook een wederzijds belang met het project team. Bij de bovenste twee, aannemer en architect, dat zou ook project team kunnen zijn. Dan pak je namelijk het uitvoerende orgaan project team, waar Brink als project manager ook onderdeel van was als adviseur.

Interviewer: Datzelfde geldt voor de architect in principe?

Project manager A: Ja met de adviseurs.

Interviewer: De communicatie had ik naar de externe partijen dus de studenten, docenten andere werknemers, hbo-instellingen, andere onderwijsinstellingen, samenwerkingspartners, omwonende en nog de andere betrokken externe partijen. Alleen het was voor mij niet echt duidelijk welke partij daar dan die communicatie doet?

Project manager A: Vooral vanuit het project team. Die samenwerkingspartners internationaal is dan meer vanuit onderwijs gezien. Dus dat was dan niet het project team, maar dat waren dan die academiectoren.

Interviewer: Dat geldt dan ook voor de andere onderwijsinstellingen?

Project manager A: Ja dat vraag ik me even af en ook die hbo instellingen. Ik zou daar de project manager van de gemeente op bevragen, maar ik zou daar even zeggen het CVB en de academiectoren.

Interviewer: Datzelfde geldt dan voor S16? Of zie jij dat dan de academiectoren dat doen?

Project manager A: Ja doe dat maar even ja. Die onderste twee, de omwonende is vanuit het project team gegaan. En andere betrokkenen dat kan diverse zijn. Ik denk CVB en project team.

Interviewer: Daaropvolgende die communicatie voorzie jij daar naar extra relaties?

Project manager A: Ja er is sowieso communicatie tussen project team en de academies en studenten om te informeren. Er is ook communicatie tussen het project team en de gemeente. Er was ook communicatie met de congregatie. Het schiet me te binnen dat er misschien ook een contractuele relatie is met de gemeente was tussen de opdrachtgever en de gemeente.

Interviewer: Dus dan zou je eigenlijk zeggen van nee dat is een contractuele relatie in plaats van een hiërarchische relatie, omdat er dan een contract is?

Project manager A: Ja en dat zit hem vooral bijvoorbeeld in overdracht van grond.

Wanneer de relaties actief zijn komen overeen de eerder bepaalde kruisjes in de tabel. Om deze reden is deze dubbeling niet opgenomen in deze transcriptie.

Interviewer: Dan hebben wij het volgens mij wel redelijk, dan was dit in principe me laatste vraag. Nogmaals ieder geval bedankt voor je tijd en mee wil werken aan dit interview, zeer waardevolle input voor mijn onderzoek dus dank daarvoor. Tot slot de vraag of jij nog inzichten, opmerkingen hebt die niet aan bod zijn gekomen tijdens dit interview wat mogelijk nog waardevol kan zijn voor mijn onderzoek?

Project manager A: Ja, je hebt die fasering, dus we hebben die engineering fase toegevoegd. Dus het kan zijn dat bij een ander project er een iets andere fasering is. Ik denk dat het goed is dat je in je onderzoek een bepaalde standaardfasering maakt die je dan tot elk project van toepassing kan verklaren.

Na de afsluiting van het gesprek had project manager A toch nog een opmerking, zie onderstaande transcriptie:

Project manager A: Je zou klanboordgroep academies en diensten nog kunnen opsplitsen in klankboordgroep en de academies, afdeling beheer en facility management die de gebouwen in beheer neemt. Waarbij de academies vooral betrokken waren in de ontwerpfase om hun input te geven en ook bijvoorbeeld hun input te geven in het programma van eisen in de initiatief fase. Terwijl afdeling beheer en FM, later in het proces eigenlijk bij de uitvoering en de oplevering betrokken raakten.

Interviewer: En qua relaties, want we hebben natuurlijk net de klankboordgroep samengepakt?

Project manager A: Ja dus dan was er een wederzijds belang.

Interviewer: Want dat hebben we hier gezegd met project team.

Project manager A: Ja die relatie is hetzelfde dus dat kan je zo houden, alleen die moet je wel even opsplitsen in een andere bullet.

Na uitvoering van alle drie de interviews voor deze case studie een aantal verduidelijkingsvragen gesteld, zie onderstaand.

Interviewer: Naar aanleiding van alle interviews ben ik begonnen met het uitwerken en analyseren van de gegevens. Hierbij viel mij het volgende op, we hebben namelijk gezegd dat communicatie relatie met studenten, docenten en andere werknemers van BUAS stopt na de uitvoering en deze er dus niet is tijdens de oplevering. Toch denk ik persoonlijk dat dit er tijdens oplevering ook wel is toch?

Project manager A: Studenten/gebruikers zijn inderdaad ná oplevering wel betrokken door communicatie over de oplevering en de inhuisperiode die daarop volgt. Vanuit het projectteam heeft communicatie plaatsgevonden om studenten/gebruikers te informeren dat het gebouw is opgeleverd, dat opdrachtgever A druk bezig is met inhuizen en bijv. de lokalen in te richten.

Interviewer: Daarnaast vroeg ik me af of ik de relatie tot de gemeente niet moet opdelen in twee types, in de initiatief fase (neem aan dat dan de pachtovereenkomst is gesloten?) een contractuele relatie met het CVB en daarna een hiërarchische relatie omdat ze daarna de omgevingsvergunning moeten verlenen en ook bijvoorbeeld de bouw kunnen stilleggen.

Project manager A: Goed idee om de relatie met de gemeente op te delen in twee types. Jouw voorstel voor contractueel en hiërarchisch lijkt me prima.

Interview advisor-director A

Interviewer: Een hele goedemiddag, zoals ik zojuist aangaf zal dit interview worden uitgevoerd in kader van mijn afstudeeronderzoek. Allereerst zal ik in het interview wat vragen stellen over jouw achtergrond. Vervolgens zou ik ingaan op de betrokken stakeholders van deze case studie en dan specifiek per fase. Ten slotte zal ik wat vragen over onderlinge relaties tussen deze stakeholders en hoe deze veranderen. Naar verwachting zal dit interview circa één uur duren. Zijn er vanuit jou nog vragen voordat we beginnen?

Advisor-director A: Nee.

Interviewer: Zou je wat meer kunnen vertellen over jouw huidige functie en ervaring binnen Brink dan wel andere partijen waarvoor je hiervoor hebt gewerkt?

Advisor-director A: Mijn functie binnen Brink is directeur van management en advies. Sinds 26 jaar betrokken bij dit bedrijf, ooit vanuit mijn tweede studie hier begonnen met een afstudeeropdracht en nooit meer weg gegaan. Mijn vakgebied is project management. Wat zou je nog meer willen weten?

Interviewer: Qua type projecten waar je normaalgesproken betrokken bij bent is dat publiek, privaat, nieuwbouw of renovatie? Of is dat een mix van alles?

Advisor-director A: Nee de rode lijn daarin is dat het langdurig is.

Interviewer: En dan zit je al vanaf begin aan tafel?

Advisor-director A: Ja.

Interviewer: Zoals ik aangaf is stakeholder management een belangrijk onderdeel van mijn onderzoek. Dus vroeg ik me af in hoeverre speelt stakeholder management een belangrijke rol binnen jouw dagelijkse werkzaamheden?

Advisor-director A: Dat is van belang om vooruit te kunnen, zeker als wij een campus ontwikkelen dan maken wij altijd onderscheid in shareholders en stakeholders. Als je een shareholder bent dan bepaal je mee en als je een stakeholder bent dan praat je mee. Dat is een duidelijk verschil wat niet altijd goed valt maar dat is wel hoe het werkt. Maar stakeholders zijn onmiskenbaar nuttig en nodig, daar kun je ook niet omheen. Ook publieke partijen door die tijdig mee te nemen in je verhaal loopt het gewoon soepeler, dus gaat het vaker goed.

Interviewer: Dan specifiek focus ik me op het dynamische aspect van deze netwerken. Dus ik vroeg ik me af in hoeverre ben jij je bewust van dit dynamische aspect? Dus dat er stakeholders gedurende het project bij komen dan wel afvallen, dan wel dat de relaties wisselen.

Advisor-director A: Het heeft ook logischerwijs te maken met de rol die ze spelen in zo'n project. Bijvoorbeeld stel een gemeente nadat de omgevingsvergunning is verstrekt zijn zij een tijd uit beeld, dan voegen ze ook niks toe. Maar in het begin zijn die veel meer betrokken, omdat je je plan uiteindelijk goedgekeurd krijgt. Maar bijvoorbeeld eindgebruikers die zijn er vanaf het begin tot eind en die zijn juist in het begin heel betrokken, dan meer toetsend en dan meer goedkeurend op het einde. Ja je opdrachtgever natuurlijk altijd. En ik weet niet of je andere partijen waarmee je het werk ontwerp en realiseert of jij die daar ook onder verstaat?

Interviewer: Ja die neem ik ook mee, zowel ontwerpende als uitvoerende partijen.

Advisor-director A: Dan hangt het erg van de bouworganisatievorm af wie in welke fase op welke manier betrokken is.

Interviewer: Vervolgens zou ik graag wat vragen willen stellen over de betrokken stakeholders en dan specifiek per fase voor dit project. Voorafgaand aan dit interview heb ik project documentatie geanalyseerd en ook al een eerste interview uitgevoerd. Dus het zal ook voornamelijk een verificatie zijn van wat ik al eerder heb verkregen. Dus allereerst de vraag zijn er stakeholders die jij in deze lijst mist? Dat kan zowel interne als externe stakeholders zijn, dan wel zou jij anders definiëren?

Advisor-director A: Dit klinkt wel heel compleet. Diegene die hier wellicht ontbreekt is de publieke financierder.

Interviewer: Daaropvolgende de kruisje die je hiervoor je ziet, dat zegt dus wanneer een bepaalde stakeholder betrokken is geweest bij het project. Dus die loop ik dan graag even met je langs om te kijken of jij je kan vinden in de fases die nu vermeld staan.

Interviewer: Met project manager A hadden we gezegd dat het CVB de officiële opdrachtgever van dit project is en daarom ook die contractuele relaties naar het CVB lopen.

Advisor-director A: Ja.

Interviewer: Terugkomende op de fases, dus raad van toezicht heb ik nu gezegd die zaten vanaf het begin tot de uitvoering. Belangrijk om te weten is dat ik de oplevering eigenlijk zie als een moment zijnde dat de overdracht is naar opdrachtgever zelf. Dus dan hadden we gezegd die zit daar dan officieel niet bij.

Advisor-director A: Ja.

Interviewer: College van bestuur en die academiedirecteuren van begin tot eind. Die klankboorgroep vanaf initiatief tot en met definitief ontwerp, facility management die kwamen vanaf de uitvoering erbij richting de oplevering. Dus ingebruikname van het pand.

Advisor-director A: Ja met dien verstande dat zij als eindgebruiker van het pand wel ook ten behoeve van het programma van eisen input hebben geleverd. Dus in die initiatief fase.

Interviewer: Het interne project team, vanaf begint tot eind natuurlijk. Datzelfde geldt dan voor de project manager van Brink. De architect en de adviseurs die kwamen allemaal vanaf het voorlopig ontwerp tot oplevering.

Advisor-director A: Ja.

Interviewer: De aannemer, omdat het een engineer and construct is die pas vanaf de engineering, datzelfde geldt natuurlijk ook voor de onderaannemers. Dan hebben we de nog wat interne experts binnen opdrachtgever A zelf. Allereerst duurzaamheid, veiligheid en installaties daarvan hebben we gezegd die zitten in de ontwerpfase: voorlopig, definitief ontwerp. En de inkoop expert die zit eigenlijk in de initiatief fase voor de aanbesteding van je ontwerpteam en daarna in je definitief ontwerp voor je aanbesteding van je aannemer.

Advisor-director A: Ik heb wel de indruk dat ook die interne experts wel ook in de initiatief fase ten behoeve van het programma van eisen hebben meegewerkt.

Interviewer: Dan hebben we de congregatie daarvan hebben we ook gezegd tot en met uitvoering.

Advisor-director A: Nee dat geloof ik niet, volgens mij hebben ze dat pand gekocht en daarna zijn we aan de gang gegaan en daar hebben zij geen rol meer in gespeeld.

Interviewer: Nee dus eigenlijk in het initiatief is het gewoon gesloten?

Advisor-director A: Ja.

Interviewer: Dan hebben we nog de studenten, docenten en andere werknemers, vanaf voorlopig ontwerp tot en met je uitvoering. En dan hebben we gezegd in de engineering, het technisch ontwerpen niet echt.

Advisor-director A: Nee.

Interviewer: De gemeente dan initiatief, alle ontwerpfases en je uitvoering.

Advisor-director A: Ja ook.

Interviewer: Dan hadden we eigenlijk voor S21-23, dat wist project manager A niet goed wanneer die betrokken zijn geweest.

Advisor-director A: Andere HBO-instellingen niet, behalve er zijn wat bezoeken gebracht om ideeën op te doen. Maar die zijn niet op een andere manier betrokken geweest.

Interviewer: En in welke fase zou dat dan zijn geweest?

Advisor-director A: Voorlopig ontwerpfase. Voor andere onderwijsinstellingen in de gemeente, dat kan op meerdere momenten zijn geweest zo'n communicatie.

Interviewer: Dat zou je dan voorlopig en definitief ontwerp zeggen?

Advisor-director A: Met name ja. Misschien een beetje in de initiatief fase als het om parkeerbeleid gaat.

Interviewer: Dan hebben we nog de samenwerkingpartners zowel nationaal als internationaal.

Advisor-director A: Dat liep eigenlijk via die academies. Maar daar hebben wij geen rechtstreekse contacten mee gehad in dit project.

Interviewer: Dan hebben we nog de omwonenden, die hadden we nu gezegd definitief ontwerp, uitvoering en oplevering.

Advisor-director A: Ik denk dat het nog wel wat eerder is geweest. Die zijn continu wel aangehaakt geweest. Dus ik zou initiatief wellicht niet, maar voorlopig ontwerp zeker wel en daarna zijn ze op de hoogte gehouden.

Interviewer: Tenslotte nog publike financierder, wanneer is die betrokken geraakt?

Advisor-director A: Dat zal denk ik in de initiatief fase zijn geweest.

Interviewer: En dan eigenlijk tot het eind gewoon?

Advisor-director A: Ja.

Interviewer: Daaropvolgende dan die relaties en daarmee maak in onderscheid tussen drie vormen van een stakeholder relatie. [Verderde uitleg gegeven]. Beginnende met de contractuele relaties. Dan hebben we het CVB met de project manager, college van bestuur met de architect en alle adviseurs. De aannemer, de congregate natuurlijk voor de aankoop van het klooster. De aannemer met zijn eigen onderaannemers en project manager B zei ook nog dat er een contract is tussen het college van bestuur en de gemeente ... voor de overdracht van de grond. Mis jij hier nog contractuele relaties partijen?

Advisor-director A: Misschien dan dat hierbij hoort een contract met de publieke financierder.

Interviewer: En die is dan ook weer met het college van bestuur?

Advisor-director A: Ja.

Interviewer: Daaropvolgende de tweede vorm van een stakeholder relatie, dus wederzijdse belangen dan wel hiërarchie. Beginnende met de hiërarchie dan hadden we gezegd dat er een hiërarchie is binnen opdrachtgever A zelf. In de zin van CVB en raad van toezicht en dat raad van toezicht boven hun staat. En dan ook weer het CVB richting het project team.

Advisor-director A: Ja.

Interviewer: Dan de wederzijdse belangen, die zit dan met het project team en de project manager richting de aannemer, de uitvoerende partij. Dan ook weer richting het ontwerp team, dus je architect en je adviseurs. Dan ook weer tussen de architect en de aannemer. Klankboorgroep en je project team. Ditzelfde geldt voor de afdeling beheer en facility management. En dan je interne experts ook weer richting je project team van opdrachtgever. Mis ik hier nog relaties dan wel zeg jij nou dat zijn eigenlijk geen wederzijdse belangen?

Advisor-director A: Dat klopt.

Interviewer: Daaropvolgende de laatste vorm van een stakeholder relatie en dat waren die communicatie mogelijkheden en daarvan heb ik gezegd project team van opdrachtgever A die faciliteert de communicatie richting de studenten, docenten en andere werknemers. Dan hebben we het CVB plus zijn academiedirecteuren richting de andere HBO-instellingen in Nederland en datzelfde geldt voor onder onderwijsinstellingen in de gemeente.

Advisor-director A: Ja.

Interviewer: Dan hebben we nog richting de omwonende, dat doet dan ook weer het project team en richting die andere betrokken externe partijen is dat een combinatie van je CVB en je project team. Dan hebben we tenslotte ook richting nog de congregatie, daar is natuurlijk een onderliggend contract, maar zoals je zei is daar ook gedurende het project nog wat updates geweest. En project manager A zei dat project manager gemeente A dat heeft gedaan.

En datzelfde geldt voor de gemeente om daar ook gedurende het proces communicatie te houden en updates te geven, dit zijn we van plan, dit gaan we doen en zo staat het er nu voor.

Advisor-director A: Ja.

Interviewer: Mis ik hier nog communicatie mogelijkheden dan wel zeg jij daar kloppen dingen niet in?

Advisor-director A: Nee wat hier staat dat klopt.

Interviewer: Als jij voordereest niet nog relaties hebt dan komen we eigenlijk bij het eind van dit interview. Dus nogmaals bedankt voor je participatie en bedankt voor je waardevolle inzichten en verificatie van wat ik al eerder had. En tenslotte eigenlijk nog de vraag van heb jij inzichten die niet tijdens het interview aanbod zijn gekomen waarvan jij zegt daar zou ik toch nog verder gaan kijken? Dan wel nog vragen over dit interview?

Advisor-director A: Nee die heb ik nu niet.

Interview project manager client A

Interviewer: Nogmaals goedemiddag, zoals ik zojuist aangaf wordt dit interview uitgevoerd in kader van mijn afstudeeronderzoek. Allereerst zal ik wat vragen stellen over uw achtergrond en ervaring. Vervolgens zou ik ingaan op de betrokken stakeholders en dan specifiek wanneer is een bepaalde stakeholder nou betrokken geraakt bij het project. Ten slotte zal ik wat vragen stellen over de onderlinge relaties tussen de stakeholders en hoe deze veranderen gedurende het project. Naar verwachting zal dit interview circa één uur duren. Zijn er vanuit jou nog vragen voordat we beginnen?

Project manager client A: Nee.

Interviewer: Zou u wat kunnen vertellen over uw huidige functie?

Project manager client A: Mijn functie op het moment van het project was dat ik hoofdhuysvesting was van opdrachtgever A. Mijn laatste studie in deze richting was dat ik de master vastgoed en facility management heb gedaan aan de RUG in Groningen. Mijn vorige studie was onderwijsmanagement en ik had dus geen kaas gegeten van bouwen en huysvesting.

Interviewer: En u heeft altijd voor opdrachtgever A gewerkt of ook nog voor andere partijen?

Project manager client A: Nee daarvoor heb ik een tijd een eigen bedrijf gehad op een heel ander vakgebied, op het gebied van automatisering. Ik was voor die tijd docent automatisering. Toen ben ik naar opdrachtgever A gegaan en daar was ik in eerste instantie

verantwoordelijk voor de externe relaties, met name het bedrijfsleven. En toen dat klaar was, toen vroegen ze aan mij wil jij huisvesting niet gaan doen?

Interviewer: Dan specifiek focus ik me op stakeholder management, dus vroeg ik me af hoe belangrijk was stakeholder management binnen jouw werkzaamheden voor opdrachtgever A?

Project manager client A: Ik vond het zelf heel belangrijk omdat opdrachtgever A een organisatie was en is die graag in goede harmonie en samenwerking met de stakeholders wil werken.

Interviewer: Dan specifiek focus ik me op het dynamische karakter van stakeholder management, onder het mom van dat die netwerken veranderen gedurende het project doordat er stakeholders bijkomen dan wel verlaten en ook die relaties onderling wijzigen. Dus vroeg ik me af in hoeverre ben jij bewust geweest van dit dynamische karakter?

Project manager client A: Ja met name in eerste instantie want je hebt een bouwvergunning nodig en je bent dus afhankelijk van het wel of niet indienen van bezwaren was het toen nog tegen het project. Dus vooraf zenden, uitleggen wat je gaat doen met het project, we hebben bijeenkomsten georganiseerd bij ons in het gebouw om de bewoners te informeren over wat we zouden gaan doen. Dus in die fase was het contact vrij intensief en ook belangrijk voor het verkrijgen van de vergunning en daarna werd het meer op de hoogte houden en informeren.

Interviewer: Vervolgens zou ik graag wat vragen willen stellen over de betrokken stakeholders en dan specifiek wanneer is dan een bepaalde stakeholder betrokken geraakt. [Verdere uitleg gegeven]. Maar de eerste vraag is, mist u in deze lijst nog stakeholders? En dat kan zowel interne als externe stakeholders zijn.

Project manager client A: De huidige gebruiker van het pand staat die er nu ook bij?

Interviewer: Ja de huidige gebruiker van het pand, dat waren andere betrokken externe partijen heb ik dat genoemd. Alleen daar wisten zowel advisor-director A als project manager A niet goed hoe die nou betrokken zijn geweest?

Project manager client A: De zusters waren uiteindelijk bereid om het klooster aan ons te verkopen. Maar ze moesten zelf ergens anders naar toe en ze hadden proactief vastgoedmanagement uitgevoerd door naast het klooster wat wij kochten al een klein klooster te bouwen met zorgfuncties. Maar dat hadden ze verhuurd aan huidige gebruiker en de zusters dachten die gaan er dan uit en dan gaan wij er in. Maar de huidige gebruikers zeiden we gaan er helemaal niet uit, we hebben een huurcontract. Toen is woningcorporatie A ingeschakeld en die nieuwbouw gepleegd in dezelfde wijk voor de huidige gebruikers. Brandveiligheid was een dingetje, dus de brandweer van gemeente A.

Interviewer: Daaropvolgende dan wanneer een bepaalde stakeholder betrokken is geraakt. Beginnende met het raad van toezicht, hebben we gezegd initiatief tot en met de uitvoering. Dan hebben we college van bestuur, de academiectoren, klankboorgroep.

Project manager client A: Ik ben even bij vijf aan het denken, want de afdeling beheer en FM die is ook wel all the way betrokken geweest. Dus ik denk bij het voorlopig ontwerp en het definitieve ontwerp dat daar die afdeling beheer en facility management er wel bijhoort. Project team, ja wij zijn er de hele tijd geweest. Project manager ja. Architect, ja. Aannemer, ja. Interne expert duurzaamheid, die is ook betrokken geweest.

Interviewer: Daarvan hebben we gezegd, die experts tot en met DO.

Project manager client A: Ja. Interne expert aanbesteding, ja. Studenten, docenten en andere, ja. Gemeente die heeft ook een controlerende taak in de uitvoering.

Interviewer: Ja, ik heb hem wel in de uitvoering staan. Het enige wat ik nog denk, moet die ook niet officieel bij de oplevering staan, omdat uiteindelijk de gemeente denk ik ook wat zaken moet goedkeuren?

Project manager client A: Ja met name de brandweer en dat is in opdracht van de gemeente.

Interviewer: Dus dan zou je de gemeente ook bij de oplevering zetten?

Project manager client A: Ja dat denk ik wel.

Interviewer: Dan komen we bij een aantal stakeholders waar zowel project manager A als advisor-director A vrij weinig vanaf wist. Beginnende met die andere HBO instellingen hebben we gezegd alleen in het voorlopig ontwerp?

Project manager client A: Ja we zijn gaan kijken bij een aantal instellingen, hoe hebben jullie het ingericht.

Interviewer: Dat is dan in het voorlopig ontwerp geweest?

Project manager client A: Ja in die periode.

Interviewer: Andere onderwijsinstellingen, daarvan hebben we nu gezegd initiatief tot en met definitief ontwerp.

Project manager client A: Ja ik denk dat dat klopt.

Interviewer: Samenwerkingspartners?

Project manager client A: Dat zijn dus de hogescholen en universiteiten waar wij mee samenwerken.

Interviewer: Heeft dat een rol gespeeld in het klooster project?

Project manager client A: Nee.

Interviewer: Omwonende hebben we dan nog en daarvan hebben we gezegd, de ontwerpfases: voorlopig en definitief ontwerp, uitvoering en ook de oplevering?

Project manager client A: Ja. De huidige gebruikers zijn in de initiatief fase geweest en datzelfde geldt voor de woningcorporatie. En de brandweer ook in de ontwerpfase hebben die aan tafel gezeten.

Interviewer: Zowel voorlopig als definitief ontwerp?

Project manager client A: Ja.

Interviewer: Dan hadden we ook nog gezegd publiek financierder, omdat die het geld heeft vrijgemaakt?

Project manager client A: Ja.

Interviewer: Dan hebben we alle stakeholders gehad, nog een laatste vraag hierover is dat ik natuurlijk zeg initiatief en dan voorlopig ontwerp, officieel heb je daar nog een schetsontwerp tussen zitten. Komen die partijen die ik nu heb staan in het voorlopig ontwerp overeen met het schetsontwerp?

Project manager client A: Ja. Wat ik mis in dit verhaal is ons interieurteam.

Interviewer: Dat was intern dan of is dat een nieuwe partij?

Project manager client A: Externe partij.

Interviewer: Die is dan in dezelfde fases betrokken geweest als de architect?

Project manager client A: Nee die kwam later, het DO was al klaar. En zij moest binnen de kaders van het DO konden ze hun gang gaan.

Interviewer: Daarnaast zou ik wat vragen willen stellen over de relaties en daarmee maak ik onderscheid tussen verschillende vormen van een stakeholder relatie. [Verder uitleg gegeven]. Dan beginnende met de contractuele relaties. We hebben gezegd dat het college van bestuur de officiële opdrachtgever is van dit project.

We hebben gezegd college van bestuur, projectmanager, de aannemer, de congregratie voor de aankoop van het klooster. De architect plus al je adviseurs, want het is in principe gecontracteerd als integraal ontwerpteam.

Project manager client A: Ja.

Interviewer: Valt die interieurarchitect die we toegevoegd hebben hier ook onder of dat een losse?

Project manager client A: Nee dat is een losse.

Interviewer: Dan hebben we de aannemer met zijn eigen onderaannemers. Dan hadden we nog het college van bestuur richting de gemeente met betrekking tot de grond. Dan hadden we tenslotte nog college van bestuur richting de financierder.

Project manager client A: Ja.

Interviewer: Dan de tweede vorm van stakeholder relaties, dus wederzijdse belangen dan wel hiërarchie. Beginnende met de hiërarchie. We hadden gezegd raad van toezicht die staat bovenaan de ladder en daaronder valt het college van bestuur en de academie directeuren en onder het college van bestuur en de academie directeuren valt het project team.

Project manager client A: Niet onder de academie directeuren. Het college van bestuur heeft aan de ene kant de aansturing van de faculteiten en aan de andere kant de aansturing de hele organisatie verder.

Interviewer: En dan viel het project team van opdrachtgever A ook onder het college van bestuur?

Project manager client A: Direct onder het college van bestuur.

Interviewer: Daaropvolgende dan de wederzijdse belangen. Daar hebben we eigenlijk gezegd van project team opdrachtgever A samen met project manager richting de uitvoerende partijen en datzelfde geldt voor het ontwerpteam. En hier valt dan ook je interieurarchitect onder dan?

Project manager client A: Ja.

Interviewer: Dan hadden we ook nog gezegd de architect richting de aannemer zijnde. De klankboorgroep en je academies met project team en datzelfde geldt voor je afdeling beheer en facility management. De architect met al die adviseurs en misschien ook nog de interieurarchitect met de architect?

Project manager client A: Ja.

Interviewer: Dan hadden we nog het project team van opdrachtgever A richting alle interne experts.

Project manager client A: Ja dat klopt.

Interviewer: Zit er ook nog een relatie tussen de academie directeuren en jullie als project team opdrachtgever A?

Project manager client A: Ja, geen hiërarchische, maar wel een samenwerking.

Interviewer: Wederzijds belang zou je dan zeggen?

Project manager client A: Ja, zo zou je het kunnen noemen.

Interviewer: Mis ik voorderest nog wederzijdse belangen tussen partijen? We hebben natuurlijk ook een aantal partijen toegevoegd, dat is misschien ook wel goed om daar nog eens kritisch naar te kijken. We hebben dan huidige gebruiker, woningcorporatie en de brandweer. Dus hoe verlopen die relaties?

Project manager client A: De brandweer dat is wel een belangrijk relatie met het project team en met de aannemer. Dus de aannemer werd op het matje geroepen door de brandweer als dingen niet klopte en dan zei de brandweer tegen ons jullie aannemer die maakt er een potje van.

Interviewer: Dan zou je zeggen de aannemer? Of zou je dan zeggen dan de brandweer uiteindelijk richting het CVB? Omdat de brandweer richting de officiële opdrachtgever van dit project kan zeggen we gaan niet open?

Project manager client A: Ja dat klopt.

Interviewer: Dan hadden we nog de huidige gebruiker en woningcorporatie, dat is misschien dan een contractuele relatie geweest richting die partijen?

Project manager client A: Nee als opdrachtgever A hadden wij geen contract, die twee samen wel natuurlijk. Alleen massage geweest van opdrachtgever A, van gaan jullie asjeblijft wat samen doen want dan kunnen wij het klooster kopen.

Interviewer: Dus dan zou je zeggen het project team van opdrachtgever A een relatie richting zowel huidige gebruiker als woningcorporatie.

Project manager client A: Ja en het college van bestuur. Wij deden dat samen. Ik had contact huidige gebruiker bijvoorbeeld want die mensen kende ik en CVB had contact met woningcorporatie.

Interviewer: Zou u dan zeggen dat was ook een wederzijds belang of communicatie?

Project manager client A: Dat vind ik lastig, het was ons belang uiteindelijk maar het werd wel een gedeeld belang.

Interviewer: Overgaande op de communicatie dan hebben we gezegd project team opdrachtgever A richting studenten, docenten en andere werknemers. Andere Hbo-instellingen daarvan hebben we gezegd het CVB en de academie directeurs, klopt dat?

Project manager client A: Ja. Andere onderwijsinstellingen klopt ook zoals je het hebt opgeschreven.

Interviewer: Dan hebben we nog de omwonende.

Project manager client A: Ja dat ging via het project team.

Interviewer: Deze (relatie naar congregatie) hadden we ook nog genoemd richting de congregatie is natuurlijk een contract voor de aankoop van het klooster. Maar project manager A gaf aan dat gedurende project, nadat het project gesloten is ook wel wat communicatie is geweest.

Project manager client A: Ja wij hebben hun goed geïnformeerd altijd.

Interviewer: Dan hadden we tenslotte nog gezegd richting de gemeente zijnde dat daar ook continue contact mee is geweest.

Project manager client A: Ja ze waren er altijd bij.

Interviewer: Nu heb ik dan engineering heb ik niet gezegd, dus uitvoeringsgereed ontwerp. Zou u daarvan ook zeggen dat daar ook nog communicatie is geweest of niet?

Project manager client A: Nee dat denk ik niet.

Interviewer: Dat komt ons dan tot het eind van dit interview, nogmaals bedankt voor participatie en uw tijd. Tenslotte nog de vraag of u nog inzichten of opmerkingen heeft die tijdens het interview niet aanbod zijn gekomen die nog wel waardevol worden geacht voor mijn onderzoek? Dan wel of u nog vragen heeft over het interview zelf?

Project manager client A: Nee dat denk ik niet.

Case study B

Interview project manager B

Interviewer: Zoals ik net al aangaf, wordt dit interview uitgevoerd in kader van mijn afstudeerproject. Ik zal allereest beginnen met wat vragen over jouw achtergrond, ervaring, rol etc. Daarna over de betrokken stakeholders en dan specifiek van wanneer is een bepaalde stakeholder nou betrokken bij het project. Ten slotte zal ik nog wat vragen stellen over de onderlinge relaties tussen deze stakeholders en hoe deze dan veranderen. Naar verwachting zal dit interview ongeveer één uur duren. Zijn er nog vragen vanuit jou voorafgaand aan het interview?

Project manager B: Nee.

Interviewer: Zou je wat meer kunnen vertellen over jouw functie en ervaring binnen Brink?

Project manager B: Project manager B, 19 jaar werkzaam bij Brink, ik heb uitvoeringstechniek gestudeerd bij de TU. Dus mijn focus binnen Brink ligt op einde ontwerptraject en de realisatie fase. Bij dit project, ben ik vanaf het begin betrokken binnen het programma B, dat is een alliantieprogramma. Specifieke zaken die je dan wil weten van mij?

Interviewer: Misschien kan je wat meer vertellen over de type projecten waar je normaalgesproken betrokken bij bent? Zijn dat voornamelijk publieke, private projecten, nieuwbouw, renovatie, of is dat een mix?

Project manager B: Ja dat is eigenlijk een grote mix, het is van publiek tot private ondernemingen. Van middelbare scholen tot productieomgevingen en fabrieken. En nu bij de gemeente B is het eigenlijk gewoon kantoorgebouwen die dan verduurzaamd worden en dat is dan ook een grootschalige mix tussen nieuwbouw, renovatie, of vernieuwbouwprojecten.

Interviewer: De volgende vraag die ik had in hoeverre speelt stakeholder management een belangrijke rol binnen jouw dagelijkse werkzaamheden binnen Brink?

Project manager B: Ik zie mijn werk eigenlijk meer als een spin in het web, waarbij het van belang is dat alle partijen die betrokken zijn bij het project in beeld te krijgen en op de juiste manier ook bij het project te betrekken. Ik probeer afhankelijk van de grote van het project te kijken hoever moet die reikwijdte zijn van mijn stakeholderoverzicht en wat voor impact hebben die verschillende mensen op mijn project. Als ze eigenlijk niet zoveel impact hebben dan wil ik weten wat de naam is en het telefoonnummer bij wijze van spreken en bel ik ze op als ik ze nodig heb en dan verder niet. Maar als je echt heel veel impact heeft dan probeer ik ze ook wel mee te nemen in het project, informeren en dat soort dingen.

Interviewer: Daarnaast is het dynamische aspect van stakeholder netwerken een belangrijk onderdeel van mijn onderzoek. Dus was ik wel benieuwd in hoeverre jij je bewust van het dynamische karakter?

Dat zie ik dan zijnde dat er stakeholders bijkomen gedurende het project danwel dat er relaties tussen bepaalde partijen wisselt en of je daar mogelijk voorbeelden van kan geven die je hebt ervaren in projecten?

Project manager B: Ja als de hele bouwfase eigenlijk doorloopt, van definitie fase, voor fase, tot een realisatie fase dan heb je eigenlijk per fase al verschillende stakeholders. Dus je begint in mijn optiek met een heel klein gezelschap wat in het ontwerptraject verder uitgroeit richting de realisatie waarbij steeds meer mensen erbij komen en misschien ook wel mensen weer afvallen. Want in een ontwerpfase dan heb je misschien adviseurs erbij zitten die tijdens de realisatie fase niet meer nodig zijn.

Interviewer: Dan gaan we over op het tweede deel van mijn interview en daar wil ik graag wat vragen stellen over de betrokken stakeholders en wanneer deze dan betrokken zijn geraakt. Voorafgaand aan dit interview heb ik de project documentatie die jij hebt verstrekt aan mij geanalyseerd en op basis daarvan een eerste inventarisatie gemaakt. Dan is de eerste vraag hierover welke stakeholders mis jij nog in deze lijst? Dan wel zou jij anders definiëren en dat kan zowel interne als externe stakeholders zijn.

Project manager B: Ik denk dat deze (lijst) wel vrij compleet is.

Interviewer: Dan nog de vraag over deze lijst, welke partij moet ik nou zien als de officiële opdrachtgever van dit project? Is dat dan de programma directeur?

Project manager B: De programma directeur. Dus Brink krijgt opdracht van de programma directeur, alleen de programma directeur moet vanuit de gemeente ook opdracht krijgen. Dus als je kijkt wie de daadwerkelijke opdrachtgever is, is dat de gemeente B, dus de contract manager gemeente. Dan de programma manager huisvesting dat is denk ik dan ook van de gemeente en die is eigenlijk ondersteunend aan contract manager gemeente. Dus vormen een soort duo vanuit de gemeente kant en tegenover staat dan de schouderpartners van programma B. Dus in dit overzicht zijn S1 en S2 dat zijn eigenlijk schouderpartners, dat zijn de directeuren vanuit de gemeente en programma B en S3 en S4 zijn ook nog schouderpartners.

Interviewer: Ja dat zijn de relaties, daar komen we straks in het derde deel bij. Dus mocht jij niet nog extra stakeholders hebben dan zou ik graag overgaan tot wanneer is een bepaalde stakeholder nou betrokken geraakt bij het project. [Verder uitleg gegeven]. Beginnende met de stakeholders die betrokken zijn geraakt bij de initiatieffase, welke stakeholders zijn dat

Project manager B: Dat zijn eigenlijk één, twee, drie, vier, die zijn er allemaal. Ja de projectleider programma dat ben ik dan denk ik?

Interviewer: Ja dat ben jijzelf ja.

Project manager B: Ik dan ook vanaf de initiatiefase, projectleider VOF nog niet, S7 ook niet, acht niet, negen wel deels. Financieel manager wel, prestatie manager wel, installatie wel, projectleider architect wel, constructeur niet, ICT niet, facilitair manager niet. Onderhoud hier moet je eigenlijk ook projectleider onderhoud programma en eentje maken van de gemeente.

Interviewer: Want ik zag ook dat er dus een onderscheidt werd gemaakt tussen projectleider onderhoud bouwkundig en projectleider onderhoud installaties, ondanks dat uit de documentatie bleek dat dat exact dezelfde persoon was?

Project manager B: Ja dus S17, dat is de overkoepelende projectleider onderhoud en die heeft dan twee personen onder zich, die ene kant de bouwkundige doet en de andere kant het installatietechnische doen.

Interviewer: Ja dus deze horen bij programma B?

Project manager B: Ja en dan is het aan de gemeente kant eigenlijk dat we niet een overkoepelende projectleider onderhoud hebben, maar daar het is dan meteen onderhoud bouwkundig en onderhoud installatietechnisch.

Interviewer: Dan waren we gebleven bij projectleider onderhoud.

Project manager B: Nee die zat er niet bij en allemaal de rest nog niet.

Interviewer: Datzelfde geldt dan voor de omwonende en de toekomstige gebruikers?

Project manager B: Nee bij dit project eigenlijk niet.

Interviewer: Daaropvolgende dan het voorlopig ontwerp, ik neem aan dat S1 tot en met S5 dan ook?

Project manager B: Ja die blijven alle fases betrokken en de VOF die gaat vanaf het voorlopig ontwerp meelopen tot het einde. De bouwkundige en installatietechnische die starten pas vanaf het definitief ontwerp. Projectleider gemeente ook alle fases, financieel manager ook alle fases, prestatie manager ook alle fases, installatieadviseur alle fases. Want hieruit heb je alleen maar aangegeven dat ze bij alle fases betrokken zijn, maar de rol verandert ook. Dus net als installatieadviseur B, die heeft in het initiatiefase en voorlopig ontwerp is die de kartrekker van het geheel en vanaf het definitief ontwerp ligt die kartrekkersrol om de installaties verder uit te werken dan bij de VOF. S13 die is ook alle fases, de constructeur vanaf het voorlopig ontwerp, projectleider ICT die hebben we eigenlijk pas vanaf definitief ontwerp meegenomen, facilitair ook, onderhoud ook.

Interviewer: Dat geldt eigenlijk voor alle project leiders onderhoud?

Project manager B: Ja.

Interviewer: Maar heeft hij dan ook contact met die project leiders van onderhoud?

Project manager B: Ja ik denk wel dat hij contact heeft, hij gaat dan wel al wat vragen stellen in de zin van kan ik het meerjarig onderhoudsplanning ontvangen. Dus dan zouden we denk ik bij voorlopig ontwerp bij die projectleider onderhoud programma B, denk ik wel een x-je moet hebben staan.

Interviewer: En die van de gemeente niet eigenlijk?

Project manager B: Nee volgens mij niet.

Interviewer: Dan hebben we de laatste twee, de omwonende en toekomstige gebruikers.

Project manager B: De omwonende die is echt pas bij de realisatie eigenlijk. En de toekomstige gebruikers die hebben wij wel geïnformeerd bij het definitief ontwerp en bij de realisatie.

Interviewer: Daaropvolgende de onderlinge relaties tussen die verschillende partijen. Daarvoor heb ik ook al een eerste inventarisatie eigenlijk gedaan en belangrijk om te weten is dat ik onderscheid maak tussen de verschillende vormen van een stakeholderrelatie. [Verdere uitleg gegeven]. Beginnende met de contractuele relaties, dan voorzie ik een relatie tussen de opdrachtgever en programma manager van programma B. Dan geldt hier de contractmanager?

Project manager B: Je hebt nu contractmanager gemeente dat was S2 en de programma directeur programma B, S1, die hebben een contractuele relatie.

Interviewer: Dan ook de contract manager met de projectleider van programma B en de volgende die ik voorzag is omdat jullie een geïntegreerd contract hebben gebruikt. Dan dacht ik dat tussen de opdrachtgever richting die projectleider van de VOF?

Project manager B: Ja de contractuele relatie die is hier nogal een beetje ingewikkeld, formeel geeft de gemeente opdracht, laat ik het maar even makkelijker maken aan programma B en programma B geeft dan weer opdracht aan de VOF.

Interviewer: Dan had ik de VOF met de installatie adviseur, ik weet niet of het consortium die adviserende partijen danwel architect, constructeur heeft?

Project manager B: Ja dat heeft er eigenlijk mee te maken dat zij op een gegeven moment dus een UAV-GC contract kregen, vanaf definitief ontwerp waarbij de installatie adviseur en project leider architect en de constructeur eigenlijk onder de VOF vielen, daarwel ze daarvoor eigenlijk onder programma B vielen.

Interviewer: Ja dus ze hadden eerst een relatie dan met de contract manager?

Project manager B: Ja vanuit S1 dan weer en dat was dan inderdaad met die installatie adviseur, want die was er al in de initiatieffase en met de architect.

Interviewer: Verder nog contractuele relatie die ik nu nog mis?

Project manager B: Nee volgens mij niet.

Interviewer: Oké top, dan gaan we zo in op wanneer een bepaalde relatie actief was. Maar eerst de volgende en dat gaat dan over wederzijdse belangen dan wel hiërarchie. Beginnende met de hiërarchie. Programma manager huisvesting dan met programma directeur?

Project manager B: Nee dan met de programma manager programma B.

Interviewer: Is dat een hiërarchische relatie in de zin van dat programma manager van programma B die programma manager van de huisvesting kant kan bepalen wat er gebeurt of zou meer zeggen dat er juist een wederzijds belang is?

Project manager B: Meer een wederzijds belang.

Interviewer: De volgende was van de programma directeur met de projectleider van de gemeente?

Project manager B: De programma directeur programma B die staat niet boven projectleider gemeente, daar is geen hiërarchie. Ik denk als ik er zo naar kijk zou je de hiërarchie aan de kant van de gemeente en de hiërarchie aan de kant van programma B inzichtelijk moeten hebben. Die zie ik dan hier niet zo snel, of ik snap het niet dat kan ook.

Interviewer: Nee dus laten we dan beginnen met de hiërarchie binnen programma B. Welke hiërarchie is er dan binnen programma B?

Project manager B: S1 staat boven S4.

Interviewer: En hetzelfde geldt dan voor S5?

Project manager B: Geldt voor S5, eigenlijk voor alles dat daar onder valt. Daar zit een soort schifting in, programma directeur gaat ook boven alles maar dat wil niet zeggen dat S4 dan gelijkwaardig is aan alle programma B partners. Dus S4 zit dan eigenlijk in hiërarchie ook weer boven alle anderen.

Interviewer: En welke anderen?

Project manager B: Nou ja dus S4 die staat dan weer boven projectleider programma B, projectleider VOF, projectleider installaties, architect. Dan niet S10 en S11. Ja maar ook twaalf. Ja en dan zou je ook nog de onderhoud projectleider erbij kunnen pakken, dat is S17 dan. Dus hier zit best wel wat hiërarchie in hoor, want dan zou je ook weer kunnen zeggen dat S5 die staat dan weer boven S7 en acht.

Interviewer: En niet boven S6 (projectleider VOF)?

Project manager B: Ja ook, dus eigenlijk steeds een stapje lager heb je eigenlijk weer iemand die verantwoordelijk is.

Interviewer: Dus dan hebben we eigenlijk zes, zeven en acht en vallen dan ook de architect en de rest van deze partijen er onder?

Project manager B: Ja en dat van de kant van programma B en je hebt dezelfde hiërarchie binnen de gemeente en dan zie je eigenlijk dat schouderprincipe ontstaan.

Interviewer: En vanuit de gemeente dat is dan S2 de hoogste en die dan naar S9?

Project manager B: Ja en die S9 die gaat dan weer boven de groepjes van de gemeente (ICT en facilitair) en dan mis je nog S10 en S11, nou die vallen in dit overzicht dan onder S1.

Interviewer: En voor de gemeente hebben we dan nog je projectleiders onderhoud?

Project manager B: Ja die vallen dan onder S9.

Interviewer: De programma directeur heeft dan een hiërarchie met financieel en prestatie manager?

Project manager B: Ja en ook hier zou je eigenlijk weer een schifting moeten maken, financieel manager programma B, financieel manager gemeente. Voor elke rol hebben we er eentje van programma B en eentje van de gemeente en die lopen qua faseringen overal hetzelfde mee. En de relatie die we binnen programma B hebben gemaakt die kan je eigenlijk identiek kopiëren naar die van de gemeente.

Interviewer: Dan hebben we die ondervangen, dan had ik voorderest zelf ook nog een hiërarchie, tussen S6, S7 en S8. Omdat de projectleider VOF natuurlijk boven de twee bouwkundige en installaties staat.

Project manager B: Ja klopt. Ja die VOF S6 en S17 die zijn eigenlijk een beetje gelijkwaardig.

Interviewer: Dus daar zou je eerder zeggen van die hebben een wederzijds belang met elkaar dan dat er een hiërarchie is?

Project manager B: Ja klopt.

Interviewer: Dan had ik ook nog richting de ICT en facilitair management dat daar mogelijk een hiërarchie is dan wel wederzijds belang zitten?

Project manager B: Nee het is niet dat de projectleider gemeente boven de ICT of facilitair staat. Het is een wederzijds belang ja en dat geldt voor onderhoud eigenlijk idem dito.

Interviewer: Dan dacht ik zelf ook nog dat er een wederzijds belang zou zijn tussen S4 en S3, omdat die beiden focussen op de huisvesting.

Project manager B: Ja er staat wel programma manager huisvesting, maar eigenlijk dat is gewoon programma manager gemeente en niet huisvesting.

Interviewer: Dan dacht ik ook nog met de installaties van de VOF met de installatieadviseur, ik neem aan dat natuurlijk ook die twee partijen mogelijk ook met elkaar communiceren?

Project manager B: Ja die hebben geen hiërarchie.

Interviewer: Ik had hier wederzijds belang.

Project manager B: Ja die hebben geen hiërarchie, maar die hebben wel een wederzijds belang. Dan met de financieel manager en prestatie manager, dan kan ik mezelf ook voorstellen dat daar een wederzijds belang in zit. Omdat, prestaties waarschijnlijk deels uitgedrukt wordt?

Interviewer: En dan dacht ikzelf ook nog die programma manager nu dan gemeente met de architect?

Project manager B: Nee dat is dus niet zo die wederzijdse belangen is er ook niet.

Interviewer: Mis ik hier nog relaties?

Project manager B: Ja je zou kunnen zeggen wederzijds belang in de zin van programma manager programma B en gemeente in relatie met projectleider programma B en gemeente.

Interviewer: Want projectleider programma B hadden we van gezegd dat daar dus een hiërarchie tussen zit.

Project manager B: Ja dat is eigenlijk meer S5 (interne project manager) en S9 (externe project manager).

Interviewer: Die nieuwe projectleiders van de onderhoud?

Project manager B: Ja dat zit in de hiërarchie, dus projectleider programma B die heeft onder zich alleen van programma B. En S17 heeft een wederzijds belang met projectleider gemeente bouwkundig en installaties

Interviewer: Dan hebben we tenslotte nog de aanwezigheid van directe communicatie, dan dacht ik sowieso communicatie richting de omwonende. Ik weet niet welke partij of stakeholder dat gefaciliteerd heeft? En daarnaast richting de toekomstige gebruikers verwacht ik zelf ook communicatie toe.

Project manager B: Ja dan heb je eigenlijk weer nog een nieuwe stakeholder, dat is de communicatie man binnen programma B en die heeft vanaf voorlopig ontwerp, definitief ontwerp, realisatie en oplevering heeft die dat allemaal gedaan.

Interviewer: Engineering ook?

Project manager B: Ja maar dan is er bijna geen communicatie, nee dat maakt niet uit maar kan je wel zo noemen. En die valt dan weer onder programma manager.

Interviewer: Ja dat is dan een hiërarchie? En dan is dat is dan de programma manager van programma B?

Project manager B: Ja in basis van programma B en dan de schouderpartner gemeente, hadden er twee eigenlijk. Dus de communicatie manager verantwoord eigenlijk naar de programma manager en de gemeente, omdat dat gewoon een duo is. Ook richting de omwonenden en dat doet hij dan wel weer samen met iemand binnen de gemeente dus daar heeft hij ook een koppeltje. Die hebben een wederzijds belang, geen hiërarchie ook geen contractuele relatie.

Interviewer: Dan hebben we het volgens mij wel, dus dan komen we bij het eind van het interview. Nogmaals ieder geval bedankt voor participatie en waardevolle input voor mijn onderzoek, dat waardeer ik. Tenslotte nog een vraag van mij naar jou of jij nog inzichten hebt of opmerkingen die mogelijk nog waardevol kan zijn voor mijn onderzoek?

Project manager B: Ja dat moet ik even laten bezinken als er iets te binnenschiet dan laat ik dat jou nog wel weten. Nu heb ik zo snel geen tips.

Na afloop van het interview via mail nog een aanvullende vraag gesteld, zie onderstaand.

Interviewer: De partijen die in het schetsontwerp betrokken zijn geweest komen die overeen met dat van het voorlopig ontwerp?

Project manager B: Zelfde partijen

Interview project manager client B

Interviewer: Nogmaals goedemorgen en zoals ik zojuist aangaf, wordt het interview uitgevoerd in het kader van mijn afstudeerproject. Ik zal allereerst wat vragen stellen over jouw achtergrond, wat algemene vragen, daarna in gaan op de betrokken stakeholders en dan specifiek per fase, dus wanneer is nou een stakeholder betrokken geraakt bij het project? Tenslotte zal ik wat vragen stellen over de onderlinge relaties tussen stakeholders en dan ook weer specifiek gezien hoe veranderen deze dan gedurende het project? Naar verwachting zal het interview ongeveer een één uur duren. Zijn er vanuit jou nog vragen voordat we aan het interview beginnen?

Project manager client B: Nee vooraf niet.

Interviewer: Zou je wat meer kunnen vertellen over jouw huidige functie en ervaring?

Project manager client B: Ik ben 45 jaar geleden begonnen bij architectenbureaus. Toen ben ik op gegeven moment bij het ministerie B komen werken bij de afdeling vastgoed, eerst hier in de regio later bij de landelijke directie. Toen ben ik naar gemeente B gekomen, de afdeling vastgoed, daar hebben wij eerst onderhoud gedaan van alle panden. Toen als laatste karwei eigenlijk heb ik het stadhuis van gemeente B gedaan, wat eigenlijk al onder programma B viel. Toen ik op een gegeven moment in 2020 met pensioen ben gegaan hebben ze me naar twee jaar terug gebeld, of ik misschien case studie B nog een keer wilde doen.

Interviewer: Dus qua nieuwbouw en renovatie zit er ook een beetje een mix in wat jij hebt gedaan?

Project manager client B: Ja ik deed bij die architectenbureaus zeker bij het laatste, trouwens de eerste ook deed ik ook de werkzaamheden ook buiten begeleiden. Bij ministerie B dat was ook allemaal nieuwbouw, maar dat was altijd in de uitvoering. En vooral toen ik hier bij de gemeente kwam, daar kwam ik ook veel meer in de voorbereiding van de projecten en de uitvoering erbij. Dat was hierbij case studie B ook.

Interviewer: Dan de tweede vraag, in mijn onderzoek heeft stakeholder management een centrale rol. Dus vroeg ik me af hoe belangrijk was stakeholder management eigenlijk binnen jouw werkzaamheden bij de gemeente dan wel in jouw andere banen bij andere partijen?

Project manager client B: Stakeholder management is natuurlijk heel belangrijk want je bouwt tenslotte iets voor de mensen die erin komen. Zeker bij ministerie B, maar nog meer bij de gemeente daar bouw je dus voor je collega's.

Interviewer: Specifiek focus ik me in mijn onderzoek op het dynamische karakter van stakeholder management en die netwerken dan. Onder het mom van dat betrokken stakeholder veranderen gedurende het project dan wel dat relaties veranderen.

En vroeg ik me af, in hoeverre ben jij bewust van dat dynamische karakter en heb je daar mogelijk voorbeelden van?

Project manager client B: Dat kom je dus heel veel tegen alleen we hebben dus ook vooraf afgesproken met de anderen stakeholders allemaal, we gaan het niet veranderen tijdens de rit en de aanspreekpunten voor mij dat blijven dezelfde.

Interviewer: Vervolgens zou ik dan graag wat vragen willen stellen over de betrokken stakeholders en dan specifiek per fasen. Zoals ik aangaf heb ik voorafgaand aan dit interview de verstrekte project documentatie geanalyseerd en ook al een eerste interview gehad met project manager B. Dan is mijn eerste vraag welke stakeholders mis jij nog in deze lijst dan wel zou jij anders definiëren? En dat kan zowel interne als externe stakeholders zijn.

Project manager client B: Nou ik mis hier eigenlijk geen.

Interviewer: Daaropvolgende wil ik graag verifiëren bij jou of de betrokken fases per stakeholders kloppen. Dus of jij zou kunnen aangeven, per stakeholder of het klopt en daar maak ik onderscheid tussen verschillende fases. [Verdere uitleg gegeven].

Project manager client B: Die bovenste ja. Die programmadirecteur, contractmanager en de programmamanager van de gemeente die zijn er in principe allemaal overal min of meer bij betrokken. Dan de projectleider van de VOF, dat klopt wel. Projectleider van de VOF die zit daar bij het voorlopig ontwerp al bij en bij het initiatief denk ik ook al hoor. En die van de bouwkundige en installaties die zitten misschien ook al wat eerder erbij hoor. Ik denk bij die initiatieffase dat die projectleiders van de VOF dat die alle drie zeker één en misschien wel dan twee stapjes naar voren moeten komen.

Interviewer: Ja projectleider gemeente dat ben jij eigenlijk. Die had ik nu genoteerd vanaf gewoon het begin, vanaf initiatief dus.

Project manager client B: Ja, dat is ook de bedoeling. Ja, projectleider constructeur, op een geven moment moet er gekeken worden of het kan of niet kan. Projectleider ICT van de gemeente en facilitair die moeten bij het voorontwerp zitten, ook een stapje naar voren. Want wij hebben ook al die mensen de VO tekeningen gestuurd om daar overheen te kijken.

Interviewer: Dan onderhoud dat had ik eigenlijk ook vanaf het begin vanuit programma B, dus ook vanaf het voorlopig ontwerp. En dan dat daar ook dus weer een schifting wordt gemaakt tussen projectleider onderhoud, bouwkundig en installaties en dat die dan volgens project manager B in de definitief fase. En dat zei project manager B ook voor de projectleiders onderhoud vanuit gemeente.

Project manager client B: Ja klopt.

Interviewer: Ja en de omwonenden?

Project manager client B: Als je echt zegt specifiek case studie B, is dit wel een kloppend verhaal.

Interviewer: Ja en dat gelden eigenlijk ook voor de toekomstige gebruikers, zei hij (project manager B) dat ook vooral in de uitvoering en ook in de definitief ontwerp fase.

Project manager client B: Ja.

Interviewer: Tenslotte zei project manager B ook nog dat er eigenlijk twee communicatiedeskundigen waren die dan die communicatie naar de omwonenden en de toekomstige gebruikers faciliteerde en dan zowel programma B als de gemeente.

Project manager client B: Ja want dat laatste kruisje was de oplevering? Want daar hebben onze communicatieadviseurs zich ook nog mee bemoeid, die heeft zelfs nu nog voor alle gemeente ambtenaren die interesse hadden een rondleiding georganiseerd.

Interviewer: Daaropvolgende de onderlinge relaties tussen die stakeholders. En daar maak ik onderscheid tussen verschillende vormen. [Verdere uitleg gegeven]. Beginnende met contractuele relaties en daarvan is eigenlijk de vraag van kloppen volgens jou deze contractuele relaties, dan wel mis ik bepaalde relaties tussen partijen? Dus daar heb ik de volgende relaties eigenlijk van geïdentificeerd. Dan hebben we hier nog vanuit de gemeente richting die adviseurs en de architect en constructeur. Ik had vanochtend de project manager van de aannemer aan de telefoon en hij gaf aan dat in de initiatief tot met het voorlopige ontwerp de gemeente een contract had met deze adviserende partijen en de ontwerpende partijen. En dat daarna de aannemer dus die VOF een contractuele relatie had met deze adviseurs en architecten dus dat daar eigenlijk een wisseling in zat.

Project manager client B: Ja dat klopt.

Interviewer: Dan daaropvolgende de aanwezigheid van wederzijdse belangen dan wel hiërarchie dus beginnende met de hiërarchie. De programma directeur met de programma manager van programma B en de projectleider van programma B. Projectleider programma B dat die onder zich die adviseurs dan heeft. Datzelfde geldt voor de projectleider vanuit de VOF en vanuit onderhoud vanuit programma B.

Project manager client B: Ja.

Interviewer: Installatie adviseur met dan die projectleider van de VOF en project manager B zei dat die installatie adviseur een voortrekkersrol had in het initiatief en het voorlopig ontwerp en daarna eigenlijk die relaties switcht juist van projectleider VOF dan die voortrekkersrol pakt en die is installatieadviseur daaronder valt.

Project manager client B: Ja dat klopt.

Interviewer: Contract manager met projectleider van de gemeente, want contract manager is vanuit de gemeente de hoogste persoon is. Projectleider gemeente dan met nou die ICT wat je zei en facilitair management en ook die partijen vanuit projectleider vanuit de onderhoud.

Project manager client B: Ja. Ja die zitten er dan ook allemaal bij.

Interviewer: Programma manager directeur programma B dan met zijn financieel manager en prestatie manager vanuit programma B en dan hetzelfde geldt voor de gemeente, dus de gemeente met zijn financieel manager vanuit de gemeente en zijn prestatie manager vanuit de gemeente.

Project manager client B: Ja, dat is er ook een.

Interviewer: Dan heb jij vanuit de VOF nog die hiërarchie, waaronder dus die VOF bouwkundig projectleider en installatie technisch projectleider daaronder vallen.

Project manager client B: Ja die hele rits.

Interviewer: Dan hadden we nog projectleider onderhoud van programma B. Met dan ook weer die hiërarchie, dus dat programma B ook weer een schifting heeft tussen een projectleider onderhoud bouwkundig, projectleider onderhoud installaties. En tenslotte nog de relaties tussen de communicatiedeskundige en dat met de programmamanager gemeente dan en die programma manager programma B met de communicatiedeskundige vanuit programma B.

Project manager client B: Nee ik denk een kloppend verhaaltje zo.

Interviewer: Oké perfect dan hadden we nog de wederzijds belangen. Dus dan de projectleider van de VOF met de projectleider onderhoud van programma B, omdat die projectleider vanuit de VOF het onderhouds verhaal in ieder geval eigenlijk mee wil nemen in zijn keuzes, bijvoorbeeld van bepaalde materialen, dan wel installaties, etc. Programma manager gemeente, dit zijn eigenlijk die schouder partijen, dus de programma manager van programma B met de programma manager van de gemeente.

Project manager client B: Ja nou klopt die.

Interviewer: Ja de projectleider programma B dan met de projectleider van de gemeente. Projectleider onderhoud programma B, wederzijdse belangen met de gemeente, zowel bouwkundig als onderhoud.

Project manager client B: Ja.

Interviewer: Dat is hier dan ook weer tenslotte met die communicatiedeskundige, dus ook weer die schouder partner van programma B met communicatiedeskundige gemeente. En dat is wat hier eigenlijk ook geldt, financieel manager programma B met financieel manager gemeente en prestatie manager gemeente en prestatie manager programma B. Dat je hier ook weer die schouderpartners hebt.

Project manager client B: Ja.

Interviewer: Dan was dit mijn laatste vraag en brengt dat ons tot het eind van dit interview. Dus hierbij ieder geval nogmaals bedankt voor je tijd en waardevolle input voor het onderzoek. Dan is tot slot nog mijn vraag, heb jij nog inzichten of opmerkingen die wij niet besproken hebben tijdens het interview, maar vanuit jou wel misschien waardevol worden geacht voor mij voor mijn onderzoek? Of heb jij nog vragen over dit interview?

Project manager client B: Nee, het enigste wat ik dus wel gezegd heb dit is iets anders als een bouw voor een derde partij. Omdat je hier dus als gemeente zelf het bouwheerschap heb en noem maar op en dat je met je collega's iets moet doen. Dus dat is toch anders als extern, maar dat is toevallig voor case studie B.

Interview program manager external B

Interviewer: Nogmaals goedemiddag zoals ik zojuist aangaf, wordt dit interview uitgevoerd in kader van mijn afstudeeronderzoek. Allereerst zal ik wat vragen stellen over jouw achtergrond. Vervolgens zal ik ingaan op welke stakeholders nou betrokken waren bij dit specifieke project en specifieke de focus eigenlijk wanneer zijn die stakeholders nou betrokken geraakt? Tot slot zou ik nog wat vragen stellen over de onderlinge relaties tussen deze stakeholders en dan ook weer de focus op wanneer is zo'n relatie dan actief. Naar verwachting zal dit interview ongeveer één uur duren. Zijn er vanuit jou nog vragen voordat we aan dit interview beginnen?

Program manager external B: Nee hoor helemaal niet.

Interviewer: Zou je wat meer kunnen vertellen over jouw huidige functie en jouw ervaring bij Brink?

Program manager external B: Ja, ik ben in 2015 bij Brink komen werken, 10 jaar in dienst dus nu. Daarvoor heb ik bij een groot architect gewerkt in Eindhoven, daar ervaring opgedaan. Ik houdt me bij Brink eigenlijk met twee dingen specifiek bezig enerzijds project management/programma management en anderzijds specialiseer ik me ook in het informatiemanagement rondom projecten of organisaties die projecten uitvoeren of gebouwen onderhouden.

Interviewer: Qua type projecten zit jouw focus meer bijvoorbeeld de publieke projecten, private projecten, nieuwbouw, renovatie. Of is dat eigenlijk een mix? Hoe moet ik dat zien?

Program manager external B: Het is een mix. Ik heb niet perse een voorkeur, al merk ik wel dat publieke opdrachtgevers vaak meer behoefte hebben aan ondersteuning bij het soort projecten wat ik doe.

Interviewer: Qua betrokken fases, zit jij vooral aan de voorkant of een loop je ook mee tijdens de uitvoering? Hoe moet ik dat precies zien?

Program manager external B: Ja eigenlijk over de hele breedte, dus vanaf ontwerp tot en met onderhoud ook.

Interviewer: Zoals ik aangaf is stakeholder management een belangrijk onderdeel van mijn onderzoek. Dus vroeg ik me af, in hoeverre speelt stakeholder management nou een belangrijke rol in jouw dagelijkse werkzaamheden?

Program manager external B: Nou een hele belangrijke rol. In alle projecten die wij doen speelt dat denk ik een hele belangrijke rol in sommige wat meer dan in andere. Alleen het wordt vaak niet zo expliciet benoemd of bestempeld als zijnde stakeholder management. Maar eigenlijk het grootste deel van mijn werk is het managen van stakeholders.

Interviewer: Het is eigenlijk iets automatisch wat er erbij hoort?

Program manager external B: Ja.

Interviewer: Specifiek focus ik zelf dan op het dynamische karakter van die stakeholder netwerken waar deze stakeholders dan onderdeel van zijn en dat dynamische aspect kan je dan zien dat dus stakeholders gedurende een project bijkomen of juist verlaten dan wel dat de relatie onderling tussen deze stakeholders wisselt. En vroeg ik me af of jij eigenlijk bewust bent van dit dynamische karakter van deze stakeholder netwerken tijdens de projecten waar je aan hebt gewerkt en of je daar mogelijk ook voorbeelden van hebt?

Program manager external B: Ja zeker, dat ben ik me wel bewust van en dat heeft vaak in mijn ogen in ieder geval ook te maken met dat de belangen veranderen tijdens een project in verschillende fases. Ja, we hebben dat bij case studie B ook wel meegemaakt. Zou ik een voorbeeld noemen daarvan?

Interviewer: Ja graag.

Program manager external B: Binnen programma B werken we samen met verschillende bedrijven, zijn ontwerpende partijen, architect en adviseurs en uitvoerende bedrijven, de aannemers. De afspraak is dat de architect en adviseurs de plannen maakt. Vervolgens de aannemer daar de kosten van bepaald en vervolgens ook het project uitvoert. Eigenlijk merk je op het moment dat de ontwerpfase loopt, dat de samenwerking goed verloopt. Maar op het moment dat er kosten geraamd gaan worden dan is er geen vertrouwen meer.

Dan blijken er ook andere principes gehanteerd worden door stakeholders onderling, andere belangen. Ook intern krijgen mensen dan andere belangen. Waardoor ze bepaalde samenwerkingsnormen niet meer kunnen hanteren, omdat ze in hun lijn, anders gedwongen worden.

Interviewer: Dan komen we bij het tweede deel van mijn interview, waarin ik vragen wil stellen over dan de betrokken stakeholders en dan specifiek inderdaad wanneer is een bepaald stakeholder nou betrokken geraakt bij het project? Voorafgaand aan het interview heb ik enerzijds project documentatie geanalyseerd en anderzijds al twee betrokken stakeholders geïnterviewd. Dus het zal ook voornamelijk een verificatie zijn van wat ik al eerder heb geïnventariseerd. Dat is deze tabel met daaruit komende 23 stakeholders en daarbij is eigenlijk de allereerste vraag van mis jij nog stakeholders in deze lijst? Dan wel zou jij stakeholders anders definiëren? Dat kan zowel interne als externe stakeholders zijn.

Program manager external B: Ja je kan het nog verder uitbreiden, we hebben ook een tijdelijke huisvesting moeten organiseren. Die tijdelijke huisvesting heeft natuurlijk ook weer een eigenaar. Dat is niet de gemeente, maar is een ontwikkelaar. Die is in principe ook stakeholder, maar dat gaat wel heel ver. Dit zijn in ieder geval de belangrijkste.

Interviewer: Daaropvolgende dan, als jij niet voor de rest nog stakeholders hebt overgaande tot wanneer is een bepaalde stakeholder nou actief raakt. Door die eerste vijf dan: die programmadirecteur, contract manager, programmamanager gemeente, programma-manager van programma B en projectleider van programma B. Daar hebben we nu gezegd van dat is helemaal vanaf het begin eigenlijk initiatief tot aan het eind.

Program manager external B: Ja.

Interviewer: Project manager B gaf eigenlijk aan dat hij (projectleider VOF) vanaf voorlopig ontwerp eigenlijk erbij zaten.

Program manager program B: Dan klopt hij zo ja.

Interviewer: Ja en project manager B zei eigenlijk dat dan die projectleiders van de VOF, de bouwkundige en installaties eigenlijk een fase later vanaf definitief ontwerp. Daarintegen project manager gemeente B dacht dat die er ook al bij het voorlopig ontwerp erbij zaten die extra personen dus.

Program manager external B: Dat denk ik niet hoor.

Interviewer: Dan projectleider gemeente dat is ook eigenlijk vanaf het begin tot eind. Financiële managers en prestatie managers ook en datzelfde geldt voor installatieadviseur en de architect. De constructeur kwam dan een fase later. In het voorlopig ontwerp?

Program manager external B: Ja.

Interviewer: Dan zitten we bij de ICT en facilitair management vanuit de gemeente. Daar zei project manager B van dat die actief waren vanaf het definitief ontwerp. Waar in tegen projectleider gemeente B weer zei dat die eigenlijk ook al in het voorlopig ontwerp zaten.

Program manager program B: Nee, Ik denk dat wat project manager B zegt dat wel klopt.

Interviewer: Projectleider onderhoud vanuit programma B die zat er dan wel bij het voorlopig ontwerp al tot het eind. Maar die er onderstaan er dan echt het onderscheid tussen onderhoud bouwkundig en installaties die kwamen dan een fase later in het definitieve ontwerp. Datzelfde geldt voor de projectleiders vanuit de gemeente. Omwonende, heb ik begrepen dat daar eigenlijk vooral in de uitvoering dat daar nog wel wat contact mee is geweest, maar voor de rest niet echt.

Program manager external B: Ja. Klopt.

Interviewer: Toekomstige gebruikers in het definitief ontwerp en ook weer tijdens de uitvoering en de rest van de fases eigenlijk niet.

Program manager external B: Ja in het VO denk ik ook wel. Daar zijn wel behoeften op gehaald, denk ik. Ik weet het niet 100% zeker, maar ik kan me bijna niet anders voorstellen.

Interviewer: Dan tenslotte die communicatiedeskundige vanuit programma B en de gemeente voorlopig ontwerp eigenlijk tot het eind.

Program manager external B: Ja.

Interviewer: Dan hebben we de stakeholders en de betrokken fase geverifieerd, dan komen we tot het derde deel en dat zijn dan de onderlinge relaties en belangrijk is om te weten dat ik daar onderscheid maakt tussen drie vormen van een stakeholder relatie. [Verdere uitleg gegeven]. Dan beginnen we met de contractuele relaties. Dan is eigenlijk de eerste vraag, dat was voor mij nog niet helemaal duidelijk. Officieel is de gemeente volgens mij de opdrachtgever voor dit voor dit verhaal. En dan heb ik nu ook gezegd dat dus de contractmanager vanuit de gemeente die is dan de hoogst geplaatst binnen de gemeente dat hij dan een contract heeft dan met Brink. Maar ik wist niet zeker of dat dan niet juist via de programma directeur vanuit programma B. Die dan die contracten heeft?

Program manager external B: Ja de gemeente heeft alleen een contract met programma B.

Interviewer: Maar dan is inderdaad met programmamanager van programma B, projectleider programma B en ook met de aannemer dan neem ik aan dat dat programma manager programma B zou moeten moeten zijn?

Program manager external B: Ja eigenlijk formeel, programmamanager kan ook. Volgens mij is de programma directeur die hier ondertekend.

Interviewer: Directeur, die bedoel ik ja.

Program manager external B: Dus die eerste zou er eigenlijk uit kunnen.

Interviewer: Programmamanager programma B ben jij dus dan heeft de programma directeur van programma B heeft een contract met jullie als Brink zijnde?

Program manager program B: Ja dat klopt.

Interviewer: Terugkomende op die adviseurs, dus installatieadviseur, de architect en de constructeur heb ik ook aannemer B nog even aan de telefoon gehad en hij zei eigenlijk dat die contractuele relatie dus switcht. Dus dat het in het initiatief en voorlopig ontwerp dat dat via programma B is en daarna eigenlijk onder de VOF valt die adviserende en ontwerpende partijen. Omdat er natuurlijk ook een geïntegreerd contract is.

Program manager external B: Ja dat klopt.

Interviewer: Mis jij nog contractuele relaties in degene die ik tot nu toe heb?

Program manager external B: Ja je hebt in die stakeholders ook die communicatieadviseur genoemd. En de financiële managers daarvoor geldt eigenlijk hetzelfde als voor de programmamanager. Die hebben een overkoepelende opdracht. En dat geldt ook voor de prestatie manager trouwens. Dus die hebben ook een contractuele relatie met programma B.

Interviewer: Voorderest nog contractuele relaties die ik mis?

Program manager external B: Ja, je hebt de tijdelijke huisvesting en dat is dan het enige. Daar zit ook een contractuele relatie, want daar hebben we als programma B hebben we tijdelijke huisvesting gehuurd. Dus daar zit ook een contract in.

Interviewer: Vanaf wanneer was die tijdelijke huisvesting aan tafel?

Program manager external B: Ja tijdens de realisatie want toen moest het gebouw leeg.

Interviewer: Maar daarvoor is denk ik wel al contact gelegd, toch?

Program manager external B: ja

Interviewer: Wanneer is dan contact gelegd? Met het definitief ontwerp?

Program manager external B: Ja, ongeveer rond die tijd.

Interviewer: Overgaande op de tweede vorm, dus de aanwezigheid van wederzijdse belangen dan wel hiërarchie, dan beginnen met hiërarchie.

Program manager external B: Misschien nog eentje, projectleider onderhoud van programma B die hebben ook zo'n zelfde overkoepelende opdracht.

Interviewer: Dan overgaande dus wat ik zei op de tweede vorm van een stakeholder relatie beginnende met de hiërarchie. Dan probeer ik een hiërarchie te maken enerzijds vanaf de programma B kant met de programmadirecteur dan bovenaan en vanuit de gemeente kant, waarbij die contractmanager bovenaan staat. Dan hebben we allereerst de programma directeur met dan de programmamanager van programma B en de projectleider van programma B en dan onder die programmamanager van programma B valt dan weer die projectleider van programma B. Of zie jij dat anders?

Program manager external B: Ik weet niet of er een hiërarchische relatie is tussen de programmamanager en de projectleider. Ik denk het eigenlijk niet, want de programmamanager, die heeft gewoon andere verantwoordelijkheden dan de projectleider.

Interviewer: Dan zou je misschien eerder zeggen dat er een wederzijds belang tussen de programmamanager en de projectleider is dan hiërarchie?

Program manager external B: Ja.

Interviewer: Dan de projectleider van programma B richting de ontwerpende partijen. Dus je installatie adviseur en architect? En de constructeur die zou hier ook onder moeten toch? En de VOF en ik hier ben dan ook staan project leider onderhoud?

Program manager external B: Ja, die laatste denk ik dan weer niet.

Interviewer: Maar in principe is er wel een relatie tussen de projectleider programma B denk ik en de projectleider onderhoud programma B?

Program manager external B: Ja maar ook weer meer wederzijds belang dan hiërarchisch.

Interviewer: Dan hadden we de installatieadviseur met de projectleider VOF wat project manager B aangaf is dat de installatieadviseur in de beginfase een soort kartrekker was en dat daarna relatie switchte. Waarbij die projectleider van de VOF van de installaties de voortrekkersrol overnam.

Program manager external B: Ja, dat klopt zeker alleen dat wil volgens mij niet zeggen dat er dan hiërarchie is. Die tweede klopt, denk ik wel. In die eerste fase is het andersom, niet zo.

Het is niet zo dat de installatieadviseur de VOF heeft gecontracteerd. Dat is wel een wederzijds belang, maar geen hiërarchische relatie.

Interviewer: Dan hadden we vanuit de gemeente de contractmanager dan bovenaan allereerste stapje is de projectleider gemeente en dan onder projectleider gemeente valt dan je ICT, facilitair management en je projectleider onderhoud vanuit de gemeente zijnde.

Program manager external B: Ik zou die projectleider zo laten staan, want die is wel degelijk gewoon ingehuurd door die contractmanager. Die projectleider gemeente heeft weinig tot geen zeggenschap over de projectleider ICT of de projectleider facilitair. Dus die hebben denk ik eerder een wederzijds belang, dat zou ik dan wel doen.

Interviewer: Datzelfde geldt dan voor je project leider van je onderhoud?

Program manager external B: Ja.

Interviewer: Dan richting de financieel manager en prestatie manager, maar die hadden we als contract volgens mij genoteerd. Ja, dat klopt van programma B zijnde wel. Dus die kunnen dan als hiërarchie dan uit? En voor de gemeente zijnde zou je hem dan wel houden als hiërarchie zijnde of ook niet?

Program manager external B: Ja, die zou ik wel zo.

Interviewer: Dan binnen de VOF natuurlijk de projectleider VOF staat dan hiërarchisch boven je bouwkundig projectleider en je installatie technisch projectleider.

Program manager external B: Ja.

Interviewer: Dan hebben we nog aan programma B zijde ook weer dan de hoofd projectleider eigenlijk van onderhoud en daaronder je bouwkundige en je installatie technische.

Program manager external B: Klopt.

Interviewer: En dan had ik nog die communicatiedeskundige gekoppeld aan de programmamanager vanuit de gemeente en de programmamanager vanuit programma B.

Program manager external B: Ja, dat klopt ook. En hier zou je ook nog bij kunnen zetten de programmamanager in relatie tot de prestatie manager en de financieel manager. Want dat valt dan wel weer onder de programmamanager.

Interviewer: Dan waren we hier gebleven, dus projectleider van de VOF met projectleider onderhoud kan me ook voorstellen daar eigenlijk een wederzijds belang in zit.

Program manager external B: Ja klopt.

Interviewer: Dan had ik nog wederzijds belang, die schouderpartij, van programmamanager vanuit programma B en die programmamanager vanuit de gemeente.

Program manager external B: Ja zeker.

Interviewer: Dan zit ik hier nog even met die financieel manager, want volgens mij heb je ook weer die schouderpartij?

Program manager external B: Die schouder aan schouder principes kan je natuurlijk op al die functies zetten. Die hebben allemaal een wederzijds belang.

Interviewer: Communicatiedeskundige, dat geldt dan hetzelfde voor en dit geldt dan ook voor die schouder partijen, onderhoud vanuit programma B, zijnde en onderhoud vanuit de gemeente zijnde? Tenslotte had ik dan nog communicatie. Samen dan de communicatiedeskundige eigenlijk vanuit programma B samen met communicatiedeskundige vanuit de gemeente die dan de communicatie doen richting omwonenden. En datzelfde geldt dan richting de toekomstige gebruikers zijnde?

Program manager external B: Ja.

Interviewer: Dan komen we nu bij het eind van dit van dit interview. Dus nogmaals bedankt voor participatie en waardevolle input. Ook blij dat je een echt wel ja kritische blik heb geworpen op wat ik al eerder had en daar nog wat aanvullingen of veranderingen aan heb gedaan. Tenslotte eigenlijk nog de vraag of jij nog inzichten of opmerkingen hebt die niet besproken zijn tijdens het interview, maar wel vanuit jouw waardevol worden geacht om mee te nemen in mijn onderzoek dan wel of jij nog vragen hebt over het interview?

Program manager external B: Nee niet echt.

Case study C

Interview project manager C1

Interviewer: Nogmaals goedemiddag, zoals ik zojuist aangaf, zal het interview worden uitgevoerd in kader van mijn afstudeerproject. In dit interview zou ik allereerst wat vragen stellen over jouw achtergrond. Vervolgens zal ik ingaan op de betrokken stakeholders en dan specifiek zou ik me focussen op wanneer is een stakeholder nou betrokken geraakt bij het project. En tenslotte zal ik wat vragen stellen over de onderlinge relaties tussen stakeholders en ook dan weer hoe deze veranderen gedurende het project. En naar verwachting zal dit interview ongeveer een uur duren. Zijn er vanuit jou nog vragen voordat we aan het interview beginnen?

Project manager C1: Nee.

Interviewer: Zou je wat meer kunnen vertellen over jouw huidige functie en jouw ervaring?

Project manager C1: Ik ben senior projectmanager bij Brink, werk daar nu iets meer dan negen jaar. Toen ik bij Brink begon gelijk begonnen aan dit project en heb daar de eerste zes jaar van de tijd dat ik bij Brink heb gewerkt aan gewerkt. Als projectmanager ben ik betrokken bij projecten in principe van begin tot eind, dus vanaf vroege initiatieffase tot en met oplevering, in verschillende rollen. Geen echte vaste sector, over het algemeen kantoren gemaakt, maar dan altijd iets van een speciaal element.

Interviewer: Dat loopt dus ook uiteen van nieuwbouw en renovatieprojecten?

Project manager C: Ja, dat is inderdaad.

Interviewer: Zoals ik aangaf speelt stakeholder management een centrale rol binnen mijn onderzoek. Dus vroeg ik me af, in hoeverre speelt stakeholdermanagement nou een belangrijke rol binnen jouw dagelijkse werkzaamheden als projectmanager?

Project manager C1: Het is heel belangrijk. Wij zijn natuurlijk als projectmanager continu in contact met allerlei mensen, organisaties, bij overheden noem het maar op. In principe doe je daarmee indirect toch dagelijks continu stakeholdermanagement. Bij de projecten waar het enorm complex is qua stakeholders doe je dat wat meer met een plan vooraf en bij de kleinere wat simpelere projecten doe je dat misschien wat meer uit de losse pols en wat minder doordacht.

Interviewer: Dan specifiek focus me op het dynamische karakter van stakeholder management. In de zin van dat die relaties onderling tussen stakeholders veranderen dan wel dat er stakeholders bijkomen of het project verlaten. Dus vroeg ik me af, in hoeverre ben jij nou bewust van dat dynamische karakter van stakeholder management in jouw projecten?

Project manager C1: Het is sowieso natuurlijk enorm dynamisch in de projectfases. Maar dat is het ook binnen een stakeholder. Als ik bijvoorbeeld kijk naar een opdrachtgever als je een project doet van zes jaar, dan kun je daar ook best wel veel wisselingen hebben binnen die organisatie. En dan is het niet zozeer dat de stakeholder wijzigt als organisatie zijnde maar wel gewoon de persoon binnen zo'n organisatie en zijn of haar rol binnen de organisatie. Dus het is niet alleen dynamisch qua type partijen en disciplines die aan worden gehaakt, maar ook de daadwerkelijke personen die zijn betrokken.

Interviewer: Vervolgens zou ik dan graag wat vragen willen stellen over de betrokken stakeholders en dan specifiek de focus op per fase. Dus wanneer is nou een stakeholder betrokken geraakt? Hiervoor heb ik voorafgaand aan dit interview de door jou verstrekte projectdocumentatie geanalyseerd en op basis daarvan een eerste inventarisatie gedaan. Die zou ik graag met jou door willen lopen en dan eigenlijk de allereerste vraag is dan mis jij nog stakeholders in deze lijst? En dat kan natuurlijk zowel intern als externe stakeholders zijn.

Hiervoor zijn ook nog een aantal zaken besproken, echter zijn deze later gewijzigd en daarom uit de transcriptie gelaten

Project manager C1: Dan hebben we het over opdrachtgever C al gehad, over projectmanagement en de rest van de adviseurs. Dan heb je twee hele belangrijke, de provincie en de gemeente.

Interviewer: Dan had ik in de omgeving gezegd de omringende bedrijven. Omdat het meer echt op een soort bedrijventerrein is gevestigd.

Project manager C1: Ja, dat zijn inderdaad de bedrijven. Dan heb je eigenlijk alle aannemers en dan heb je nog het onderscheid tussen aannemers en leveranciers

Interviewer: Is het hier zo gegaan dat je een hoofdaannemer hebt en daaronder je onderaannemers? Of hoe moet ik dat zien?

Project manager C1: Dit is niet een hoofd aanneming geweest, dus hebben een project met neven aanneming. Wij hebben een aannemer geselecteerd, dus bijvoorbeeld een bouwkundig aannemer, maar ook een installateur. De ene valt niet boven de andere, maar ze moeten wel samenwerken en die bouwkundige aannemer hebben wij de rol van coördinerend aannemer gegeven.

Interviewer: Ik denk dat we nu wel een redelijke lijst hebben dus daaropvolgende wanneer dan een bepaalde stakeholder dan betrokken is geraakt bij het project. [Verdere uitleg gegeven]. Dan beginnen we met het bestuur vanuit opdrachtgever C. Dan neem ik aan vanaf het begin tot het eind dat hun betrokken zijn geweest?

Project manager C1: Ja, maar wel op gezette momenten. Overigens vergeten we een hele belangrijke stakeholder en dat is de eigenaar van het bedrijf. En die wordt vertegenwoordigd door het ministerie C. Dus dan zou je eigenlijk kunnen zeggen, aandeelhouder.

Interviewer: En wanneer is dan met die aandeelhouder contact geweest?

Project manager C1: Ja sowieso in de initiatieffase en sowieso voor start bouw.

Hiervoor zijn ook nog een aantal zaken besproken, echter zijn deze zoals eerder benoemd gewijzigd, zie onderstaande. Om deze reden is dit deel van het interview uit de transcriptie gelaten

Project manager C1: Ja achteraf denk dat wat je ook zou kunnen doen voor opdrachtgever A is dat je niet zozeer de functies noemt dus de personen. Maar dat je meer de organen noemt dat de groepen. Dus je zou bijvoorbeeld kunnen zeggen, bestuur, bouwdirectie, project management, concept team, intern planteam, die groepen die omvatten eigenlijk alle functies. En dan zou je nog kunnen zeggen, staf functies. Dus je zou kunnen zeggen hoofdkantoor en vestiging.

Interviewer: Concept ontwikkelaar kan er dan ook uit?

Project manager C1: Nee dat is een adviseur. Dat is een ontwerper.

Interviewer: Dan hebben de afdeling inkoop van opdrachtgever A kan ook weg, maar dan houden we nog wel die inkoopmanager vanuit Brink.

Project manager C1: Ja, die houden we nog wel. Dan is het misschien makkelijker om gewoon zeggen externe projectmanager. En dan zou je aan de kant van opdrachtgever A kunnen zeggen, interne projectmanager.

Interviewer: Dan had ik nog intern nog wat adviseurs. En die waren allemaal ingehuurd toch?

Project manager C1: Ja je zou voor die losse adviseurs zou je ook kunnen zeggen, je hebt je integraal ontwerpteam en specialistische adviseurs.

Vanaf dit moment gingen we verder met wanneer een bepaalde stakeholder betrokken is geweest bij het project.

Project manager C1: In de initiatieffase is in principe iedereen vanuit opdrachtgever C betrokken.

Interviewer: Dan extern project management dat is dan Brink zijnde, jullie waren ook vanaf het initiatief eigenlijk betrokken, toch?

Project manager C1: Ja.

Interviewer: Dan hadden we de concept ontwikkelaar?

Project manager C1: Die is eigenlijk vanaf de ontwerpfase betrokken. Overigens is het ook nog dat de gemeente en de provincie in de initiatieffase al betrokken waren.

Interviewer: Dan heb je architect vanaf de ontwerpfase, datzelfde geldt voor al die adviseurs, zoals je installatieadviseur, constructeur, landschapsarchitect of niet?

Project manager C1: Ja. Dat is allemaal één partij, dus het is allemaal heel de ontwerpfase en ook al die specialistische adviseurs. En gewoon iedereen van opdrachtgever C, extern project management en de gemeente.

Interviewer: En de provincie dan niet meer?

Project manager C1: Nee, want in principe hebben wij in de initiatieffase die bestemmingsplanwijziging gedaan. Toen die is afgerond heb je niet meer te maken met de provincie.

Interviewer: De concept ontwikkelaar die zit ook gedurende de hele ontwerp fase eigenlijk aan tafel? En dan ook nog bij het uitvoeringsgereed ontwerp?

Project manager C1: ja, ook.

Interviewer: Die conceptontwikkelaar heb ik dan gezegd vanaf de ontwerpfase en dan denk ik gedurende hele ontwerpfase of ook nog tijdens uitvoering? Oplevering denk ik niet meer, toch?

Project manager C1: Jawel. Dus eigenlijk zijn al onze adviseurs, ontwerpteam, alle specialistische ontwerpers en de concept designer zijn het gehele ontwerp en realisatiefase betrokken geweest.

Interviewer: Die aannemers kwamen dan vanaf de engineering eigenlijk?

Project manager C1: Ja, uitvoeringsgereedontwerp.

Interviewer: De gemeente hadden wij gezegd dat is initiatief en dan ook nog voortdurende de rest van het project?

Project manager C1: Ja, heel dat ontwerptraject en ook in de realisatie.

Interviewer: Tenslotte hadden we nog die omringende bedrijven?

Project manager C1: Ja, die zijn eigenlijk ook het hele traject betrokken geweest.

Interviewer: Daaropvolgende de type relaties en daarmee maak ik dus onderscheid tussen drie vormen van een stakeholder relatie. [Verdere uitleg gegeven]. Beginnende dan met de contractuele relatie, dan heb ik eigenlijk gezegd tussen opdrachtgever C en dan externe projectmanager dus jullie als Brink zijnde richting de aannemer?

Project manager C1: Ja juist opdrachtgever C heeft eigenlijk contractuele relaties met alle separate partijen, uitzondering van provincie. Maar die heeft dus een contractuele relatie met ons als externe projectmanager met de concept designer met het ontwerp team met alle specialistische ontwerpers, alle aannemers. En ook een contractuele relatie in principe met de gemeente met de aankoop van de plot.

Interviewer: Zou u dan zeggen dat de contractuele relatie dan richting de bouwdirectie of het bestuur loopt? Of welke stakeholder zou je daar dan bij noemen vanuit opdrachtgever C?

Project manager C1: Als eindverantwoordelijke is gewoon het bestuur van opdrachtgever C eindverantwoordelijk voor de totale bedrijfsvoering en alle contracten die worden aangegaan.

Interviewer: Dan heb je denk ik ook nog een contractuele relatie eigenlijk tussen je coördinerende aannemer en je neven aannemers?

Project manager C1: Nee er is een coördinatie overeenkomst. Maar die coördinatie overeenkomst is in principe een contract tussen ons en alle individuele neven aannemers.

Interviewer: Daarop volgende de hiërarchie. Dus dan heb je eigenlijk weer denk ik van opdrachtgever C zijnde aandeelhouder richting bestuur als eerste? Interviewer: Dan heb je ook denk ik weer bestuur richting je bouwdirectie?

Project manager C1: Ja. Ja. Bouwdirectie richting interne project management, concept team en in principe bouwdirectie richting je intern planteam.

Interviewer: En dan hadden we ook nog die afdeling van het hoofdkantoor en afdeling van je vestiging en die zou dan richting?

Project manager C1: Ook bouwdirectie.

Interviewer: Hebben we dan nog meer hiërarchische relaties?

Project manager C1: En dan heb je hem enigszins bijzonder. In principe loop je dan van intern op projectmanager naar externe projectmanager. En loopt die van externe projectmanager naar alle andere.

Dus de externe projectmanager naar de concept designer, externe projectmanager naar het integraal ontwerpteam, externe projectmanager naar alle neven aannemers externe projectmanager naar alle specialistische ontwerpers.

Interviewer: En dan denk ik hiërarchisch gezien eigenlijk ook een relatie richting je provincie, want daar is geen contract eigenlijk mee gesloten. Maar die hebben wel iets te zeggen op wat opdrachtgever C daar wilde doen toch?

Project manager C1: Nee, de provincie die heeft bezwaar gemaakt op ons bestemmingsplanwijziging. Dus in principe hebben wij niks te maken met de provincie. We hebben geen wederzijds contact gehad. Eigenlijk is er contact geweest tussen de provincie en de gemeente.

Interviewer: En dan zou je zeggen dat is een communicatie relatie? Of wederzijds belang?

Project manager C1: Ja. Nee, ik zou zeggen dat de gemeente wel een ander belang heeft dan de provincie.

Interviewer: Dan had ik qua communicatie ook nog tenslotte richting die omringende bedrijven als communicatie relatie zijnde.

Project manager C1: Ik zou hem inderdaad op communicatie houden.

Interviewer: En welke partijen of stakeholder heeft die communicatie richting die omringende bedrijven eigenlijk gedaan?

Project manager C1: Opdrachtgever C.

Interviewer: Dus dat is dan de interne project manager?

Project manager C1: Ja en waarom ik weer twijfel er komt wel op een gegeven moment wederzijds belang. En dat gaat er meer over dat opdrachtgever C parkeerplaatsen huurt bij die omliggende bedrijven en die kunnen er dan weer iets aan verdienen.

Interviewer: Ja dan definieer ik hem inderdaad als wederzijds belang eigenlijk tussen opdrachtgever C dan en die omringende bedrijven. Tenslotte had ik dan nog een relatie gezegd tussen ontwerpteam richting de aannemer en de neven aannemers.

Project manager C1: Ja dus eigenlijk alle adviseurs en aannemers onderling.

Interviewer: Ja dan heb ik eigenlijk de relaties. Dus als jij zegt volgens mij hebben we qua relaties, hebben we het wel redelijk en we missen er niet meer dan komen we tot het einde van het interview.

Project manager C1: Ja volgens mij hebben we alle.

Interviewer: Nogmaals hartelijk dank voor je participatie en tijd en bedankt voor de waardevolle input voor mijn onderzoek. En dan tenslotte eigenlijk nog de laatste vraag, heb jij nog inzichten of opmerkingen die vanuit jouw waardevol worden geacht voor mijn onderzoek, maar niet aan bod zijn gekomen tijdens dit interview? Dan wel of jij nog vragen hebt over het interview zelf?

Project manager C1: Nee, op dit moment niet.

Interview project manager C2 (external project management)

Interviewer: Nogmaals goedemorgen zoals ik zojuist aangaf zal dit interview worden uitgevoerd in kader van mijn afstudeeronderzoek. Ik zal eerst wat vragen stellen over jouw achtergrond. Vervolgens zal ik ingaan op de betrokken stakeholders van dit specifieke project en daarbij focus op wanneer is nou een bepaalde stakeholder betrokken geraakt. Tot slotte zal ik nog wat vragen stellen over de onderlinge relaties tussen deze stakeholders en ook hoe deze dan veranderen gedurende het project. Naar verwachting zal dit interview ongeveer één uur duren. Zijn er vanuit jou nog vragen voordat we aan dit interview beginnen.

Project manager C2: Nee, ik laat het maar op me afkomen denk ik.

Interviewer: Kan je vertellen wat jouw huidige functie is en jouw ervaring?

Project manager C2: Mijn huidige functie is senior manager. Ik ben iets meer dan 18 jaar geleden bij Brink begonnen als junior. Op geklomen naar medior en uiteindelijk ben ik nu senior om het zo maar te zeggen. Ik heb gestudeerd aan de TU in Eindhoven. Daar ben ik afgestudeerd op stedenbouwkunde. Dus ik ben van origine stedenbouwkundige, maar ik heb daar niks mee gedaan.

Interviewer: En qua type projecten ben jij voornamelijk betrokken bij bijvoorbeeld publieke projecten, private projecten of bijvoorbeeld nieuwbouw of renovatie? Of is dat eigenlijk een mix?

Project manager C2: Ik denk dat ik misschien van Brink het minste in een hokje te plaatsen ben. Ik doe eigenlijk alles.

Interviewer: En qua betrokken fases zit jij er meestal al vanaf het begin bij of meer focus op de uitvoering of hoe moet ik dat zien?

Project manager C2: Het is bij mij maar zelden geweest dat ik van het begin af aan betrokken ben geweest, maar case studie C is wel een voorbeeld van waar ik echt vanaf het begin af aan betrokken ben geweest. Dat is een project wat ik van begin tot helemaal het einde heb gedaan.

Interviewer: Zoals ik aangaf speelt stakeholder management een belangrijke rol binnen mijn onderzoek. Dus vroeg ik me af, in hoeverre speelt stakeholdermanagement nou een belangrijke rol binnen jouw dagelijkse werkzaamheden?

Project manager C2: Ik heb niet zoiets van nou ik ga stakeholder management doen, hoe ik het zie is ik start een fase op en ontstaat er een hele lijst met acties waar stakeholders tussen zitten en acties in relatie tot stakeholders en daar ga ik mee op pad om het zo maar te zeggen. Dus het echt dedicated stakeholder management, het is onderdeel van projectmanagement in wat ik doe.

Interviewer: Dan specifiek focus ik op het dynamische karakter dan van stakeholdermanagement. In de zin van dat die stakeholder netwerken veranderen gedurende project doordat er stakeholders bij komen dan wel het project verlaten dan wel dat de relaties onderling tussen deze tussen deze partijen verandert. Dus vroeg ik me af, in hoeverre ben jij bewust van dit dynamische karakter? En of je daar voorbeelden van hebt van projecten waar je aan hebt gewerkt?

Project manager C2: Ik ben me zeker bewust van het dynamische karakter. Bij project X dat is misschien wel een heel goed voorbeeld. Dat is een boot omgebouwd naar een gebouw. Het was een boot die lag in Wilhelmshaven in Duitsland, dus daar heb je andere stakeholders en heb je andere regels dan dan hier weer. En uiteindelijk moest deze boot ook voldoen aan de bouwvergunning. Dus dan komer er ook wel adviseurs bij. Het is eerder denk ik dat er steeds partijen aangehaakt worden. Dan dat ze daadwerkelijk niet meer nodig zijn of niet meer betrokken zijn. Dus het lijkt wel of de bak steeds groter wordt.

Interviewer: Dan zou ik vervolgens graag wat vragen willen stellen over de betrokken stakeholders en dan specifiek per fase. Voorafgaand aan het interview heb ik enerzijds project documentatie geanalyseerd en anderzijds al een interview uitgevoerd. Dus dat zal voornamelijk een verificatie zijn voor wat ik al heb. Dan is de allereerste vraag, mis jij eigenlijk nog stakeholders binnen deze lijst? En het kan zowel intern als externe stakeholders zijn dan wel zou jij misschien anders definiëren?

Project manager C2: Rijkswaterstaat kun je ook nog toevoegen. Ik zou voor jouw onderzoek zou ik terminologie aanpassen van bouwdirectie, omdat dat tot spraakverwarring leidt, denk ik. Ik zou daar gewoon stuurgroep van maken. Want extern project management?

Interviewer: Dat zijn jullie. Daar hebben we ook gezegd van dat pakken we dan als één partij.

Project manager C2: Ja en dan heb je ook nog toezicht eigenlijk, Maar dat is niet door ons ingevuld, maar wel weer door de toezichthouder. Dus je hebt een installatie technisch opzichter en een bouwkundig opzichter

Interviewer: Voorderest nog partijen die ik mis?

Project manager C2: Nee, ik heb het gevoel wel redelijk compleet te zijn. Heb je de brandweer?

Interviewer: Nee die heb ik niet.

Project manager C2: Die zou ik er ook bij zetten.

Interviewer: Daaropvolgende dan wanneer is een bepaalde partij betrokken geraakt. Dan zie je een aantal fases wat ik dan onderscheidt beginnende eigenlijk met de aandeelhouder, zeiden we dat in de initiatieffase en daarna net voor de voor de start van de bouw en voor de rest voor de rest niet. Dan hebben we het bestuur, dat is natuurlijk vanaf het begin tot het eind.

Project manager C2: Ja.

Interviewer: Dan hebben we de stuurgroep, dat is vanaf initiatief tot start bouw en datzelfde geldt voor het interne project management en het concept team, het intern planteam en dan je afdeling vanuit hoofdkantoor en je vestiging.

Project manager C2: Ik denk dat stuurgroep en projectmanagement intern die zijn ook wel gewoon tot het einde betrokken. Intern plan team ook. Dan zou ik bij ontwerp manager, VO, DO en engineering kunnen zetten.

Interviewer: Dan heb ik extern project management gewoon gezegd van begin tot eind?

Project manager C2: Ja. Concept ontwikkelaar?

Interviewer: Van ontwerpfase tot eind, architect ook. Aannemer hebben we gezegd vanaf engineering.

Project manager C2: Dan zou ik oplevering er ook wel bij doen. Installatieadviseur ja, constructeur, ja. Landschapsarchitect kun je ook wel zo zien. Ik zou gemeente ook bij oplevering zetten, want het belangrijk onderdeel van jouw oplevering is dat ook de gemeente hier wel akkoord opgeeft. Dus uiteindelijk komt er een certificerende instantie, ik weet niet of je die moet noemen. Provincie, ja aan de voorkant. Omringende bedrijven, ja. Grondeigenaar die zou ik ook in de initiatieffase zetten. Rijkswaterstaat ook daar, maar ook bij de aanvraag bouwvergunning heeft die ook nog wel volgens mij onderdeel gehad,

Interviewer: Ja dus net voor eigenlijk voor start van de bouw?

Project manager C2: Ja en ik denk zelf dat we op basis van DO dat hebben gedaan. Toezicht installaties dat is echt uitvoering, dus de laatste twee vinkjes. Datzelfde geldt voor bouwkundig. Brandweer in iedergeval die laatste twee en bij de vergunningverlening eigenlijk

ook wel. Dus ik zou ze denk vanaf DO en engineering ook aanhaken dan. Ja en Rijkswaterstaat zou ik ook op DO en engineering zetten. En certificering brandveiligheid dat is duidelijk.

Interviewer: Ja bij oplevering?

Project manager C2: Ja ik denk dat dit aardig richting compleet gaat in iedergeval.

Interviewer: Dan daaropvolgende de onderlinge relaties en daarmee maak ik onderscheid tussen drie vormen van een stakeholder relatie. [Verdere uitleg gegeven]. Dus dan beginnende eigenlijk met contractuele relatie. We hebben dan gezegd dat eigenlijk het bestuur van opdrachtgever C de officiële opdrachtgever is van dit project, dus die ondertekent de contracten. Dan hebben we gezegd het bestuur richting externe project manager, maar dan ontwerpmanager en directievoerder horen die eigenlijk ook bij. Richting de aannemer, de neven aannemers je architect al die al die adviseurs, specialistische adviseurs en dan richting de gemeente voor de aankoop van de grond.

Project manager C2: Ja.

Interviewer: Mis jij hier nog contractuele relaties? Misschien mogelijk nog in stakeholders die we hebben toegevoegd. Deze bijvoorbeeld die toezichthouders.

Project manager C2: Dat kan op twee manieren, kunnen onder Brink werken of direct opdracht krijgen. In dit geval vielen ze volgens mij onder ons, hebben wij ze aangeschakeld. Ook tussen coördinerend aannemer en neven aannemers is een coördinatie overeenkomst. En tussen coördinerend aannemer en certificering brandveiligheid.

Interviewer: Daaropvolgende dan de tweede vorm van stakeholder relatie, dus dat zijn dan de wederzijdse belangen dan de hiërarchie beginnende met de hiërarchie. Dan hebben we allereerst gezegd een hiërarchie binnen opdrachtgever C zelf dus de aandeelhouder boven bovenaan dan het bestuur, bestuur en stuurgroep. En onder die stuurgroep valt dan hiërarchisch gezien alle andere onderdelen.

Project manager C2: Ja.

Interviewer: Ja hier had ik ook nog een hiërarchische relatie. Dit kwam dan uit die projectdocumentatie is dat de installatie adviseur die coördineert dan de input van deze partijen.

Project manager C2: Laat maar zo staan.

Interviewer: Mis ik hier nog hiërarchische relaties?

Project manager C2: Zitten er ook geen hiërarchische relatie tussen de gemeente en het bestuur dan in dit geval?

Interviewer: Ja, dat is een goede. Misschien ook nog met de brandweer toch?

Project manager C2: Ja, brandweer en bestuur denk ik ja.

Interviewer: We hadden ook nog Rijkswaterstaat en die certificering van de brandveiligheid toegevoegd. Dus ook nog een hiërarchische relatie richting die partijen?

Project manager C2: Ja eigenlijk zou heel goed kunnen zeggen Rijkswaterstaat, bestuur.

Interviewer: En die certificering van de brandveiligheid?

Project manager C2: Nee, daar mag geen hiërarchie in zitten eigenlijk. Die is onafhankelijk is die wel betaald wordt door de aannemer, dus wel een contract relatie.

Interviewer: Maar ik denk wel tussen s28, 29 dat daar wel een relatie zit, toch? Bijvoorbeeld een wederzijds belang tussen de brandweer en de certificering brandveiligheid?

Project manager C2: Ja wel een wederzijds belang.

Interviewer: Dan wederzijdse belangen hadden we gezegd interne projectmanager richting de omringende bedrijven.

Project manager C2: Ja kan me er wel iets bij voorstellen, maar is dat dan de intern project manager? Dat vraag ik me wel af, dat is gewoon opdrachtgever C.

Interviewer: Zou je eerder bestuur van maken, bijvoorbeeld?

Project manager C2: Ja dat denk ik wel. Ja en ik denk dat je als gemeenschappelijk belang is, toch wel de brandweer die certificerende instantie, de gemeente. Die vinden allemaal iets van brandveiligheid.

Interviewer: Dan tot slot hadden we eigenlijk nog aanwezigheid van directe communicatie. Dan hebben we eigenlijk alleen gezegd tussen de provincie en de gemeente zat er ook nog een.

Project manager C2: Ja het is ook Rijkswaterstaat gemeente. Kijk uiteindelijk, volgens mij zijn ook waterschappen betrokken.

Interviewer: En vanaf wanneer is die dan betrokken geweest?

Project manager C2: Ja, dat zou ik hetzelfde doen als vergunning. En ook energiebedrijven, je moet uiteindelijk stroom aanvragen, je moet water aanvragen. Maar ook data.

Interviewer: En, vanaf wanneer zijn die betrokken geweest?

Project manager C2: DO, engineering daar na uitvoering. Bij oplevering zelfs ook.

Interviewer: Nutsbedrijven is een contract lijkt me?

Project manager C2: Ja.

Interviewer: Waterschappen dat is dan misschien hiërarchisch? Want dat hebben we ook gezegd met Rijkswaterstaat eigenlijk.

Project manager C2: Ja dat is waar.

Interviewer: Misschien hier bij die communicatie ook nog dat er met die waterschappen? En het nutsbedrijf dat daar ook nog onderling nog.

Project manager C2: Ja waterschap, gemeente denk ik.

Interviewer: En die nutsbedrijven misschien richting je installatieadviseur?

Project manager C2: Daar heeft wel communicatie plaatsgevonden, dus in dit geval was het Installatietechnisch toezichthouder. Maar ik zou daar denk ik installatieadviseur dat doen.

Interviewer: En dan zou je zeggen, directe communicatie of zou je zeggen, wederzijds belang?

Project manager C2: Je hebt ook een wederzijds belang natuurlijk dat dat wordt aangesloten. Maar dan moet je de aannemer, denk ik er ook bij zetten.

Interviewer: En dan de coördinerende aannemer of alle aannemers?

Project manager C2: Ja in dit geval was het een van de neven aannemers. Ik denk dat dit het is.

Interviewer: Oké top dan komen we bij het eind van dit interview, dus nogmaals bedankt voor participatie en waardevolle input voor mijn onderzoek. En dan tenslotte is eigenlijk nog de laatste vraag of jij nog inzichten of opmerkingen hebt die tijdens het interview niet aan bod zijn gekomen, maar misschien wel nog interessant zijn om om naar te kijken? Dan wel nog vragen hebt over het interviewen zelf?

Project manager C2: Niet wat me nu zo te binnen schiet.

Na uitvoering van alle drie de interviews voor deze case studie een aantal verduidelijkingsvragen gesteld, zie onderstaand.

Interviewer: Zijn de architect plus adviseurs en landschapsarchitect als één intergraal ontwerpteam gecontracteerd?

Project manager C2: Zij zijn als één geheel onder de noemer 'ontwerpteam' geselecteerd.

Interviewer: Concept ontwikkelaar is volgens mij een externe partij? Dus heeft die dan ook weer een contractuele relatie met het bestuur?

Project manager C2: Is inderdaad een separate partij en heeft een rechtstreekse overeenkomst met opdrachtgever C.

Interviewer: Project manager client C gaf aan dat Rijkswaterstaat door toevaligheden in de final design en engineering fase betrokken geweest in dit project en dit normaalgesproken niet gebeurt (enkel in initiatief). Ben jij het hier mee eens?

Project manager C2: Voor ieder project zo dicht bij de snelweg is Rijkswaterstaat een stakeholder. Ik denk dat dit als onderdeel van de bestemmingsplanprocedure en/of omgevingsvergunningprocedure is. Dus betrokken houden in de final design en engineering.

Interview project manager client C

Interviewer: Nogmaals goedemorgen zoals ik zojuist aangaf zal het interview worden uitgevoerd in kader van mijn afstudeerproject. Allereerst zal ik wat algemenere vragen stellen over jouw achtergrond. Vervolgens zal ik ingaan op de betrokken stakeholder van dit specifieke project en dan specifiek wanneer is een stakeholder nou betrokken geraakt. Tot slot zou ik nog wat vragen stellen over de onderlinge relatie tussen deze stakeholders en dan ook weer specifiek hoe deze dan veranderen gedurende het project. Naar verwachting zal dit interview circa één uur duren. Zijn er vanuit jou nog vragen voordat we aan het interview beginnen?

Project manager client C: Nee hoor, helemaal duidelijk.

Interviewer: Zou je wat meer kunnen vertellen over jouw ervaring en achtergrond?

Project manager client C: Ik heb zelf de HTS gevolgd in Heerlen en heb daarna nog een tijdje ook aan de TU Eindhoven gezeten voor een master die ik met uitzondering van het onderdeel waar jij nu mee bezig bent heb afgerond. Ik heb in de vastgoedwereld best wat verschillende functies gehad. Ik heb een tijd in het buitenland als makelaar gewerkt. Ik ben een tijd als adviseur en consultant ben ik betrokken geweest bij grote ontwikkel projecten van voetbalstadions wereldwijd en sinds 2016 werk ik voor opdrachtgever C op de vastgoedafdeling. We zorgen voor alle belangen die wij als vastgoedeigenaar en gebruiker hebben.

Interviewer: In mijn onderzoek is stakeholder management een belangrijk onderdeel. Dus vroeg ik me af, in hoeverre speelt stakeholdermanagement nou een belangrijke rol binnen jouw dagelijkse werkzaamheden bij opdrachtgever C?

Project manager client C: Alles heeft met stakeholdermanagement te maken, denk ik.

Interviewer: Dan specifiek focus ik me op het dynamische karakter dan van die stakeholder netwerken, dus dat er stakeholders gedurende het project bijkomen dan wel misschien het project verlaten of die relaties onderling tussen stakeholders veranderen. Dus vroeg ik me af, in hoeverre ben jij bewust van dat dynamische karakter tijdens de projecten die jij draait?

Project manager client C: Daar ben ik natuurlijk van bewust en dat heeft met interne en externe stakeholders denk ik te maken. Aan het begin van een van een project zijn er bepaalde stakeholders binnen mijn eigen organisatie die een belangrijk rol vervullen en dat verandert op het moment dat een project van strategisch niveau naar het niveau van uitvoering gaat en daar worden andere stakeholders binnen mijn organisatie meer bij betrokken. Zo geldt het natuurlijk ook extern, maar dan heb je het meer denk ik over welk type partijen betrokken zijn bij een project. Waar aan de voorkant wat meer adviseurs en ontwerpers een rol spelen en later zijn er meer uitvoerende partijen die wat zwaardere stakeholders worden.

Interviewer: Vervolgens zou ik wat vragen willen stellen over de betrokken stakeholders specifiek voor deze casestudie en wanneer die dan betrokken zijn geraakt. Goed is om te weten is dat ik dus zowel met project manager C1 als project manager C2 hiervoor heb gezeten dus al een redelijke basis heb. Dus het zal ook voornamelijk een verificatie zijn wat ik al eerder heb verkregen. Maar dan is de allereerste vraag, mis jij nog stakeholders in deze lijst? En dat kan zowel een interne als externe partij zijn. Dan wel zou jij misschien anders definiëren?

Project manager client C: Nee, het ziet er vrij compleet uit. Ik geloof niet dat ik iets mis.

Interviewer: Daarvolgende wanneer dan een bepaalde stakeholder betrokken is geraakt. [Verdere uitleg gegeven]. Dan kunnen we even al deze stakeholders langslopen en dan graag of jij dan kan aangeven of dan de betrokken fases kloppen of dat er aanpassing aan gedaan moeten worden? Nou, dan beginnen we een dus aandeelhouder. Dat is helemaal in initiatief en net voor uitvoering hebben we eigenlijk gezegd dat ze daar eigenlijk een soort van go op moeten moeten geven. Dan hebben we de interne onderdelen vanuit opdrachtgever C dus bestuur, stuurgroep, project management intern hebben we gezegd dat is gewoon vanaf het begin tot en met het eind. Dan hebben we het concept team, dat is tot de uitvoering. Intern planteam hebben we ook gezegd van initiatief tot en met de oplevering.

Project manager client C: Ja.

Interviewer: De afdelingen vanuit opdrachtgever C zijnde. Dat is vanaf initiatief tot en met je engineering. Extern project management, dat is ook van begin tot eind geweest. Conceptontwikkelaar en je architect, voorlopig ontwerp tot en met eind. Dan hebben we de aannemers,... , hebben we gezegd die zijn pas betrokken geraakt bij de technische uitwerking van het ontwerp en dan tot en met de oplevering.

Project manager client C: Ja.

Interviewer: Dan hebben we die adviseurs, dat is vanaf voorlopig ontwerp tot en met het eind. Gemeente hebben we ook gezegd van begin tot eind. Provincie daar hoorde ik dat dat de provincie bezwaar heeft ingediend, die zijn dus alleen in de initiatieffase betrokken geweest. Dan hebben we nog de omringende bedrijven. Daarvan hebben we gezegd, initiatief tot en met de uitvoering en dan dus niet de oplevering zelf. De grondeigenaar ook weer in het initiatief, dus voor de aankoop van de grond.

Project manager client C: Ja.

Interviewer: Dan hebben wij Rijkswaterstaat ook helemaal in het begin en dan hebben we nog gezegd in definitief ontwerp en in de engineering.

Project manager client C: Ja, dat zal best wel eens kunnen kloppen, maar dat is meer, denk ik gebaseerd op toevalligheden dan dat het noodzaak was om dat contact in die fase te hebben met Rijkswaterstaat.

Interviewer: Dan hebben we toezicht, dat gaf project manager C2. Dat er eigenlijk ook nog twee personen waren enerzijds op de installatie en anderzijds op de bouwkundige die dan een toezichthouder waren gedurende de uitvoering plus de oplevering. Dan hebben we nog de brandweer. Daarvan hebben we gezegd, vanaf definitief ontwerp aan tafel tot en met de oplevering. En dan hadden we gezegd, nog een andere partij die dan de certificering doet voor de brandveiligheid, die is actief in de oplevering zelf om te zorgen dat het pand uiteindelijk open kan. Dan hebben we tenslotte nog de waterschappen, initiatief, definitief ontwerp en je engineering.

Project manager client C: Ja.

Interviewer: Dan hebben we tenslotte nog nutsbedrijven, dat is ook weer vanaf definitieve ontwerp tot en met oplevering.

Project manager client C: Ja in dit project klopt dat denk ik wel.

Interviewer: Daaropvolgende de relaties en goed is om te weten is dat ik daar onderscheid maak tussen 3 vormen van een stakeholder relatie. [Verdere uitleg gegeven].

Beginnende met contractuele relaties, dan hebben we eigenlijk gezegd, het bestuur is de officiële opdrachtgever van dit project. Wie hebben die nou gecontracteerd? Dat is dus de extern project manager geweest. Externe project manager heeft de bouwkundige en installatietechnische toezichthouders gecontracteerd. Dan hebben we het bestuur richting je coördinerende aannemer en je neven aannemers. Dan zit er een coördinatie overeenkomst tussen je coördinerende aannemer en je neven aannemers. Die certificering van brandveiligheid die werd ook gecontracteerd door je coördinerende aannemer. Dan hebben we nog het bestuur richting je architect en onder de architect vallen al je adviseurs. Dan hebben we nog je specialistische adviseurs een contractuele relatie. De grondeigenaar in dit geval de gemeente, waarvoor de aankoop van de grond een contract aan onderligt en uiteindelijk nog je bestuur richting je nutsbedrijven. Dus is de vraag kan jij je vinden in deze contractuele relaties dan wel mis jij nog contracten?

Project manager client C: Nee dat klopt wel.

Interviewer: Ik probeer dus wat je zegt het interne verhaal, probeer ik die relaties in de hiërarchie te zetten. Dus dan hebben we gezegd van de aandeelhouder staat dan bovenaan in hiërarchie met het bestuur. Onder je bestuur valt je stuurgroep en onder die stuurgroep vallen dan de rest van die interne onderdelen van opdrachtgever C. Klopt dit verhaal binnen opdrachtgever C? Of mis ik hier nog onderlinge relaties tussen stakeholders?

Project manager client C: Raad van commissarissen wordt bijvoorbeeld niet benoemd.

Interviewer: Wanneer zijn die dan actief?

Project manager client C: Als je het hebt over waar zitten nu, besluit momenten bij die RVC, dan denk ik dat alleen maar in de initiatieffase is. En dan mogelijk nog een keer op datzelfde moment dat die aandeelhouder is gevraagd om een handtekening te zetten, is dat eerst door de RVC gedaan.

Interviewer: Ik zeg van je hebt dan initiatief, voorlopig ontwerp, maar officieel dan heb je ook nog een zogenoemd schetsontwerp of structuurontwerp er tussenzitten. Maar in principe maar zijn de partijen die in het voorlopig ontwerp actief zijn, zijn in principe ook in het schetsontwerp betrokken geweest, toch in dit project?

Project manager client C: Ik denk dat daarmee wel alle partijen die het VO hebben gemaakt, ook in het SO aanwezig waren.

Interviewer: Dus met de RVC dan zou je zeggen, een hiërarchie tussen het bestuur en de RVC?

Project manager client C: Ja.

Interviewer: Het bestuur rapporteert nog steeds richting de aandeelhouder. Of is dat ook de RVC?

Project manager client C: Nee dat is bestuur.

Interviewer: Daarvolgende nog de rest van die hiërarchie, dus dan hebben we gezegd intern project manager heeft een hiërarchische relatie richting extern project manager. Onder externe project manager valt hiërarchisch gezien al je ontwerpers plus je concepten ontwikkelaar en ook de aannemers.

Project manager client C: Ja.

Interviewer: Dan had ook nog gezien in de projectdocumentatie dat de installatieadviseur de inbreng van de bouwfysische, brandveiligheid en duurzaamheid coördineerde dus in dat opzicht voorzag ik een hiërarchische relatie tussen deze partij. Alleen project manager C2 zei dat in de praktijk is dat zo zeer geweest. Dus ik vroeg me af in hoeverre vindt jij dat daar een hiërarchie relatie is geweest tussen die partijen?

Project manager client C: Volgens mij was dat één en dezelfde partij.

Interviewer: Dan hadden we tenslotte nog gemeente richting je bestuur en dan hiërarchische gezien zijnde dat de gemeente uiteindelijk de omgevingsvergunning moet verlenen voor het project en daardoor een hiërarchische positie heeft ten opzichte van het bestuur. Datzelfde geldt dan voor Rijkswaterstaat, waterschappen en ook de brandweer. Mis ik hier nog hiërarchie tussen bepaalde partijen? Of zeg je dit klopt wel?

Project manager client C: Dit klopt je zou nog als je wilt nog aandacht kunnen besteden aan de interne hiërarchie vanuit het project management richting de interne projectgroepen. Dus een concept team of intern planteam. Dat zijn allemaal projectteams die worden aangestuurd door intern projectmanagement.

Interviewer: En met die afdelingen van het hoofdkantoor en de vestiging. Is dat dan hetzelfde? Ook je intern project management of is dat je je stuurgroep?

Project manager client C: Ja, in onze eigen projectorganisatie hebben we dan een project orgaan dat Project Management and Control heet. Wat je hier zou kunnen noemen, zodat je weg kunt blijven van andere afdelingen. Ik denk dat het meest overzichtelijke is als je het beperkt tot hoe wij onze eigen projectorganisatie in teams weergeven. Als je project management control toevoegt, dan heb je alle projectteams die wij oplijnen heb je daarmee in kaart gebracht. Ik denk dat het wel goed is om ergens een plekje te geven aan de echte gebruiker. In de stuurgroep zit ook doorgaans iemand die verantwoordelijkheid heeft over de operatie van die vestiging, dus daarmee heeft iemand van de gebruiker een rol gekregen in dat team.

Interviewer: Die PMC zijn het nog steeds hetzelfde, dus gewoon vanaf het begin tot en met engineering?

Project manager client C: Nee alles, dus uitvoering en oplevering ook.

Interviewer: PMC viel onder de stuurgroep of onder intern projectmanagement hiërarchisch gezien?

Project manager client C: Onder intern projectmanagement.

Interviewer: Dan hebben we de wederzijdse belangen, dan hadden we gezegd bestuur richting de omringende bedrijf. Omdat project manager C2 aangaf dat die bedrijven hebben ook wel met parkeren en ook met beveiliging dat soort zaken wel een belang in dat dat goed geregeld is. Dus daarom hebben we gezegd dat is wel een wederzijds belang en niet zozeer enkel een communicatie relatie. Dan hadden we de architect richting de landschaps architect en dan ook nog alle adviseurs onderling exclusief landschapsarchitect. Dan hebben we ook weer gezegd, al die adviseurs richting je aannemers en je neven aannemers. Dan heb je nog de brandweer met de gemeente zijnde en je certificering van je brandveiligheid. Omdat deze drie partijen allemaal belang hebben bij een brandveilig gebouw.

Project manager client C: Ja.

Interviewer: Dan hebben we nog gezegd een wederzijds belang tussen installatieadviseur neven aannemer en dat is dan specifiek die verantwoordelijk is geweest voor je installaties richting nuts bedrijven. Mis ik hier nog wederzijdse belangen tussen partijen?

Project manager client C: Niet iets dat mij zo te binnen schiet nu.

Interviewer: Tenslotte hadden we nog de aanwezigheid van directe communicatie. Dan hebben we gezegd provincie en gemeenten die zullen gecommuniceerd hebben met betrekking tot het bezwaar wat ze wat ze gemaakt hebben. Dus die hebben een communicatie relatie gehad en datzelfde geldt voor Rijkswaterstaat en de waterschappen richting je gemeente. Kan jij je daarin in vinden?

Project manager client C: Ja lijkt me compleet.

Interviewer: Dan is dit het eind van het interview, nogmaals bedankt voor je tijd en je participatie dat wordt gewaardeerd en dat je waardevolle input weer hebt geleverd voor mijn onderzoek. Tenslotte is eigenlijk mijn laatste vraag of jij nog inzichten of opmerkingen hebt die tijdens het interview niet aan bod zijn gekomen waarvan jij wel zegt dat is toch wel interessant om nog mee te nemen tijdens je onder onderzoek?

Project manager client C: Niet iets dat mij zo te binnen schiet nu.

Appendix C – Grounded theory analysis

Step 1 - Open coding

Table 31: Open coding

Statement	Code	Interviewee
<i>"Ja dat is altijd belangrijk, want je hebt altijd te maken met stakeholders die je altijd hebt te managen"</i>	Key importance of stakeholder management	Project manager A
<i>"Ja ik heb dat niet bewust ondervonden"</i>	Lack of consciously experiencing stakeholder dynamics	Project manager A
<i>"Dat is van belang om vooruit te kunnen, dan maken wij altijd onderscheid in shareholders en stakeholders. Als je een shareholder bent dan bepaal je mee en als je een stakeholder bent dan praat je mee"</i>	Differentiation between stakeholders and shareholders	Advisor-director A
<i>"Maar stakeholders zijn onmiskenbaar nuttig en nodig, daar kun je ook niet omheen"</i>	Stakeholders are essential	Advisor-director A
<i>"Ook publieke partijen door die tijdig mee te nemen in je verhaal loopt het gewoon soepeler, dus gaat het vaker goed"</i>	Early involvement of public parties	Advisor-director A
<i>"Het heeft ook logischerwijs te maken met de rol die ze spelen in zo'n project"</i>	Influence of stakeholder roles	Advisor-director A
<i>"Ik vond het zelf heel belangrijk omdat opdrachtgever A een organisatie was en is die graag in goede harmonie en samenwerking met de stakeholders wil werken"</i>	Harmony with stakeholders	Project manager client A
<i>"Ja met name in eerste instantie want je hebt een bouwvergunning nodig en je bent dus afhankelijk van het wel of niet indienen van bezwaren was het toen nog tegen het project"</i>	Influence of permit procedure	Project manager client A
<i>"Ik zie mijn werk eigenlijk meer als een spin in het web, waarbij het van belang is dat alle partijen die betrokken zijn bij het project in beeld te krijgen en op de juiste manier ook bij het project te betrekken"</i>	Spider in the web	Project manager B
<i>"Ik probeer afhankelijk van de grote van het project te kijken hoever moet die reikwijdte zijn van mijn stakeholderoverzicht en wat voor impact hebben die verschillende mensen op mijn project"</i>	Stakeholder boundary	Project manager B
<i>"Ja als de hele bouwfase eigenlijk doorloopt, van definitie fase, voor fase, tot een realisatie fase dan heb je eigenlijk per fase al verschillende stakeholders"</i>	Different stakeholders at each phase	Project manager B

<i>"Stakeholder management is natuurlijk heel belangrijk want je bouwt tenslotte iets voor de mensen die erin komen. Zeker bij ministerie B, maar nog meer bij de gemeente daar bouw je dus voor je collega's"</i>	Building for the stakeholders	Project manager client B
<i>"Dat kom je dus heel veel tegen alleen we hebben dus ook vooraf afgesproken met de anderen stakeholders allemaal, we bouwen het op een gegeven moment zoals gepland. We gaan het niet veranderen tijdens de rit en de aanspreekpunten voor mij dat blijven dezelfde"</i>	Fixed contact points	Project manager client B
<i>"Nou een hele belangrijke rol"</i>	Key importance of stakeholder management	Programma manager external B
<i>"Alleen het wordt vaak niet zo expliciet benoemd of bestempeld als zijnde stakeholder management"</i>	Not always explicit	Programma manager external B
<i>"Ja zeker, dat ben ik me wel bewust van en dat heeft vaak in mijn ogen in ieder geval ook te maken met dat de belangen veranderen tijdens een project in verschillende fases"</i>	Shifts in interests	Programma manager external B
<i>"Het is heel belangrijk. Wij zijn natuurlijk als projectmanager continu in contact met allerlei mensen, organisaties, bij overheden noem het maar op. In principe doe je daarmee indirect toch dagelijks continu stakeholdermanagement"</i>	Key importance of stakeholder management	Project manager C1
<i>"Bij de projecten waar het enorm complex is qua stakeholders doe je dat wat meer met een plan vooraf en bij de kleinere wat simpelere projecten doe je dat misschien wat meer uit de losse pols en wat minder doordacht"</i>	Influence of project complexity on strategy	Project manager C1
<i>"Het is sowieso natuurlijk enorm dynamisch in de projectfases. Maar dat is het ook binnen een stakeholder."</i>	Different stakeholders at each phase	Project manager C1
<i>"Dus het is niet alleen dynamisch qua type partijen en disciplines die aan worden gehaakt, maar ook de daadwerkelijke personen die zijn betrokken"</i>	Changes in individuals	Project manager C1
<i>"Ik heb niet zoiets van nou ik ga stakeholder management doen, hoe ik het zie is ik start een fase op en ontstaat er een hele lijst met met acties waar stakeholders tussen zitten en acties in relatie tot stakeholders en daar ga ik mee mee op pad om het zo maar te zeggen."</i>	Not always explicit	Project manager C2
<i>"Dus het echt dedicated stakeholder management, het is onderdeel van project-management in wat ik doe"</i>	Part of project management	Project manager C2

<i>"Ik ben me zeker bewust van het dynamische karakter"</i>	Aware of stakeholder dynamics	Project manager C2
<i>"Het is eerder denk ik dat er steeds partijen aangehaakt worden. Dan dat ze daadwerkelijk niet meer nodig zijn of niet meer betrokken zijn. Dus het lijkt wel of de bak steeds groter wordt"</i>	Number of stakeholders grows	Project manager C2
<i>"Alles heeft met stakeholder management te maken, denk ik"</i>	Key importance of stakeholder management	Project manager C client
<i>"Daar ben ik natuurlijk van bewust en dat heeft met interne en externe stakeholders denk ik te maken"</i>	Aware of stakeholder dynamics	Project manager C client
<i>"Aan het begin van een van een project zijn er bepaalde stakeholders binnen mijn eigen organisatie die een belangrijk rol vervullen en dat verandert op het moment dat een project van strategisch niveau naar het niveau van uitvoering gaat en daar worden andere stakeholders binnen mijn organisatie meer bij betrokken"</i>	Changes in internal stakeholders	Project manager C client
<i>"Zo geldt het natuurlijk ook extern, maar dan heb je het meer denk ik over welk type partijen betrokken zijn bij een project. Waar aan de voorkant wat meer adviseurs en ontwerpers een rol spelen en later zijn er meer uitvoerende partijen die wat zwaardere stakeholders worden."</i>	Changes in external stakeholders	Project manager C client

Step 2 – Axial coding

Table 32: Axial coding

Category	Related codes
Importance of stakeholder management	Key importance of stakeholder management, stakeholders are essential, harmony with stakeholders, spider in the web, building for the stakeholders, not always explicit, and part of project management
Stakeholder dynamics	Lack of consciously experiencing stakeholder dynamics, influence of stakeholder roles, influence of permit procedure, different stakeholders at each phase, shifts in interests, changes in individuals, aware of stakeholder dynamics, number of stakeholders grows, changes in internal stakeholders, and changes in external stakeholders
Best practices in stakeholder management	Differentiation between stakeholders and shareholders, early involvement of public parties, stakeholder boundary, fixed contact points, and influence of project complexity on strategy

Step 3 – Selective coding

The objective of this step is to find the core category in the data set (Q. Liu, 2022). Looking at the axial coding two core categories can be distinguished, these are the following:

1. Category 1 - Stakeholder management
 - Sub-category 1 - the importance of stakeholder management:
This sub-category includes statements about the importance of stakeholder management in the daily work of the interviewed professional.
 - Sub-category 2 - stakeholder management strategies:
This sub-category includes statements about practical approaches used by the interviewed professional in relation to managing stakeholders in practice.
2. Category 2 - Stakeholder dynamics
This category includes statements about the interviewed professional's awareness of stakeholder dynamics in the projects he or she is involved in and the examples given.

Appendix D – Network visualizations case study B and C

Case study B

Initiative

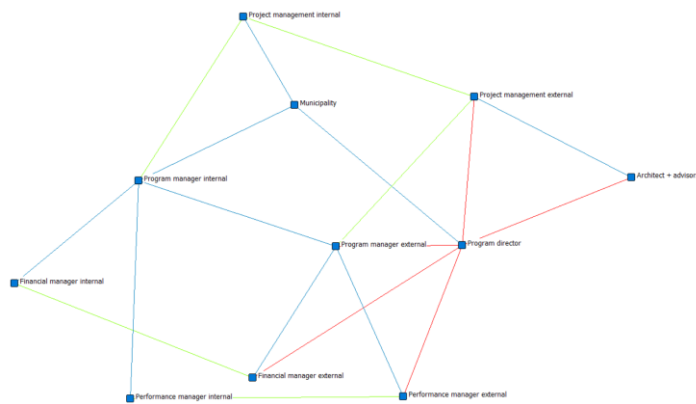


Figure 27: Network visualization initiative - Case study B

Preliminary design

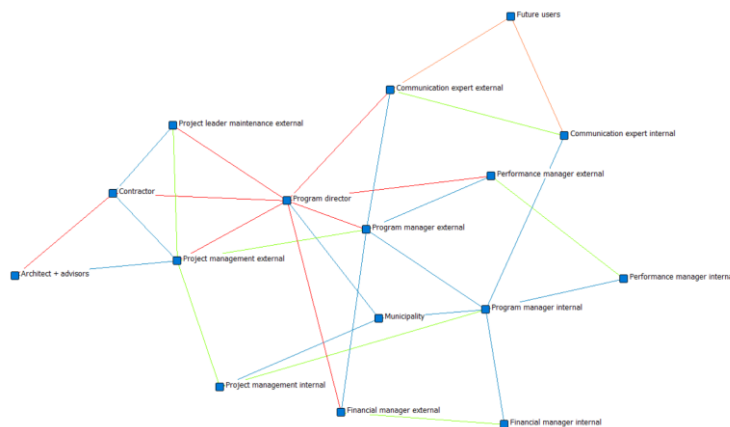


Figure 28: Network visualization preliminary design - Case study B

Final design

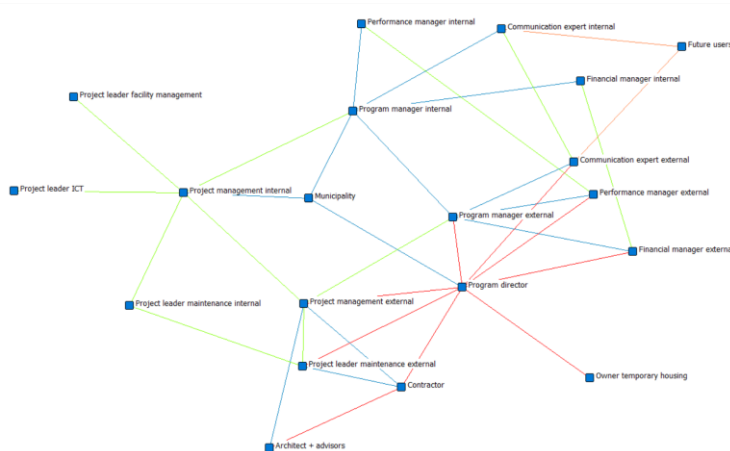


Figure 29: Network visualization final design - Case study B

Engineering

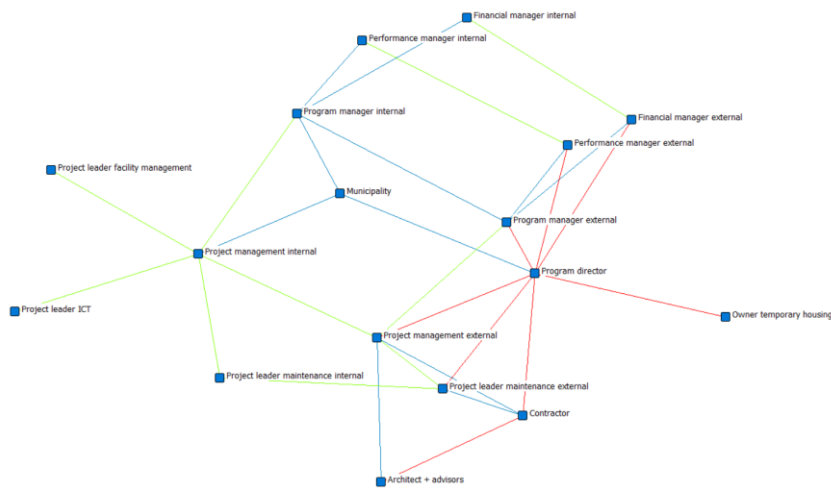


Figure 30: Network visualization engineering - Case study B

Construction

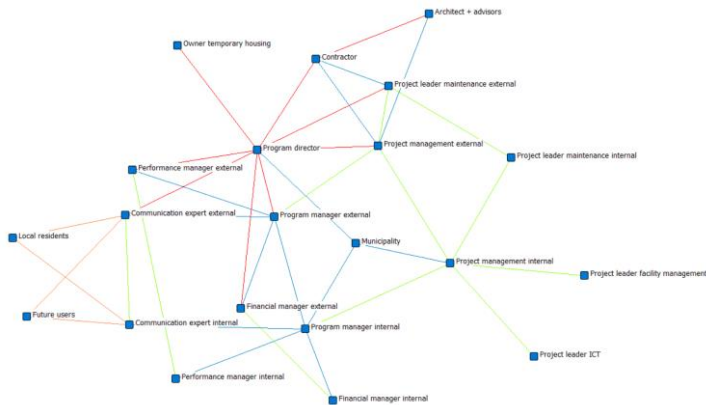


Figure 31: Network visualization construction - Case study B

Completion

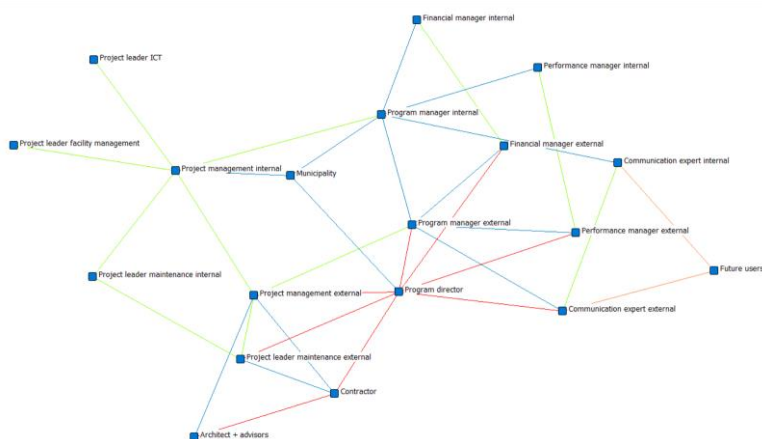


Figure 32: Network visualization completion - Case study B

Case study C Initiative

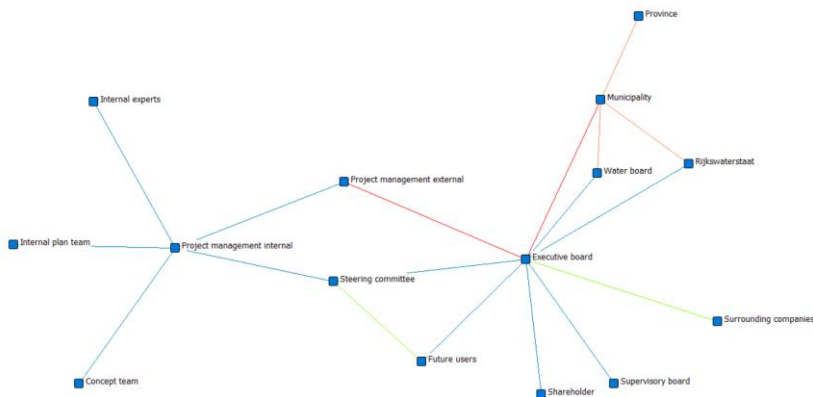


Figure 33: Network visualization initiative - Case study C

Preliminary design

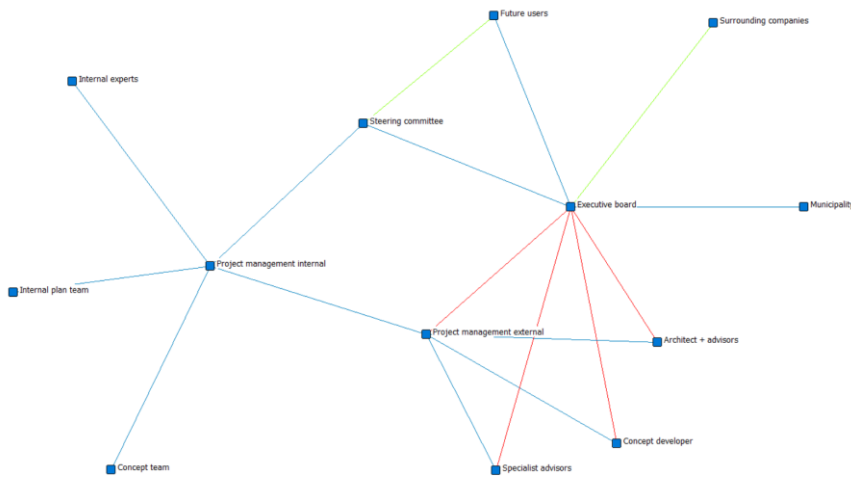


Figure 34: Network visualization preliminary design - Case study C

Final design

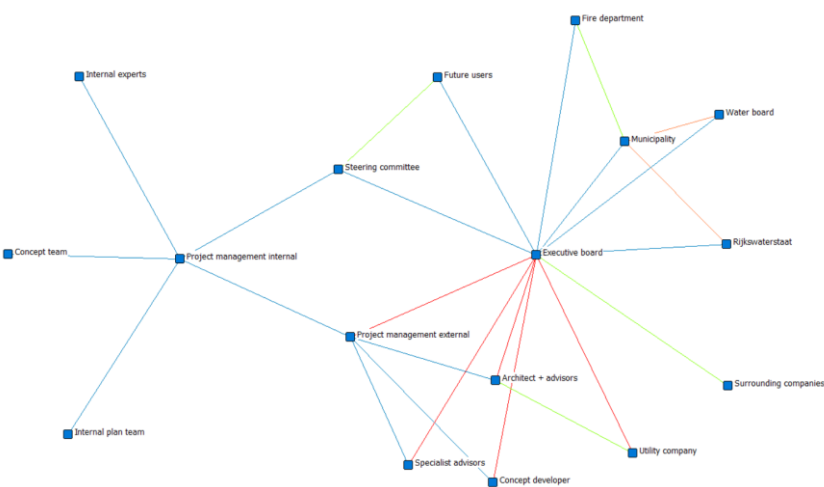


Figure 35: Network visualization final design - Case study C

Engineering

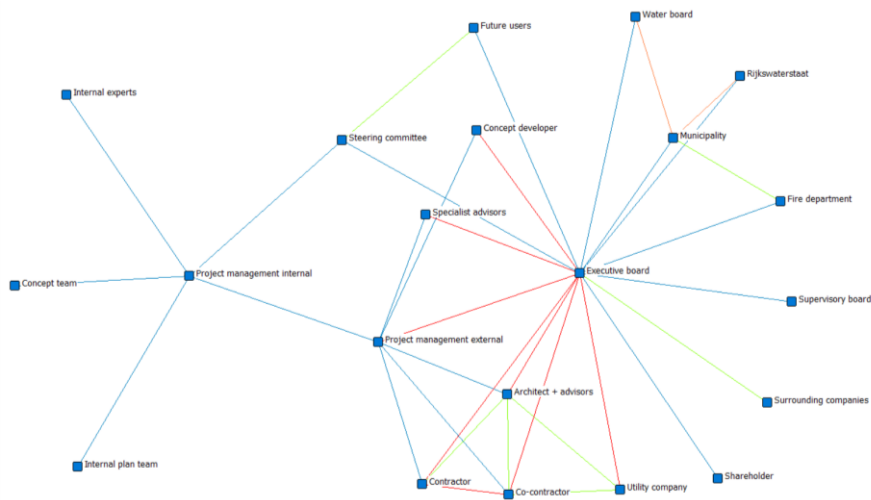


Figure 36: Network visualization engineering - Case study C

Construction

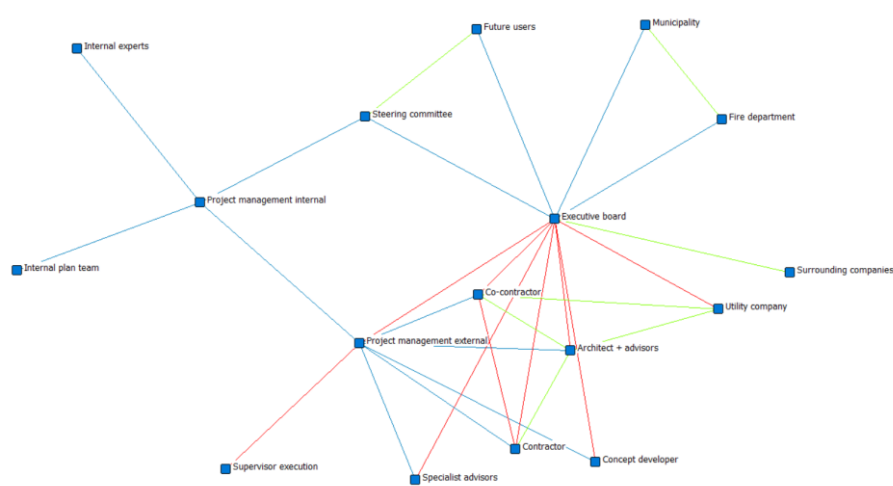


Figure 37: Network visualization construction - Case study C

Completion

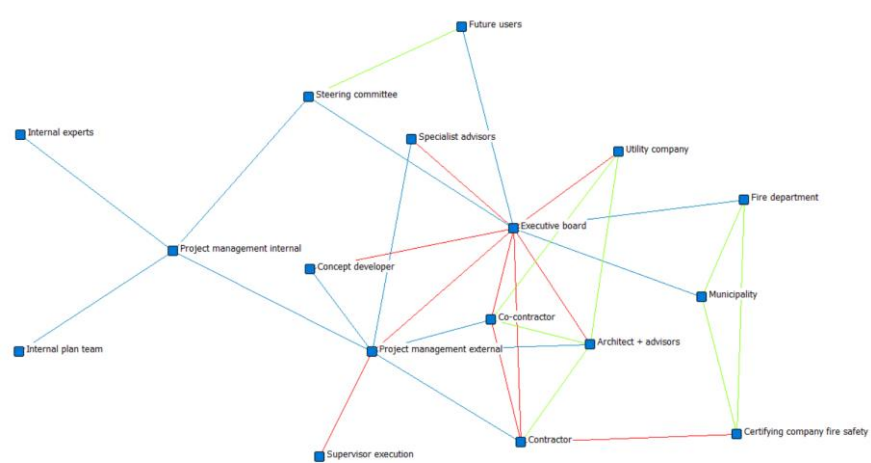


Figure 38: Network visualization completion - Case study C

Appendix E – Social Network Analysis case study B and C

Case study B

SASF 1 - Assessing attributes of stakeholders

The three stakeholder attributes of power and proximity can be determined by using four centrality metrics: degree, betweenness, closeness, and eigenvector centrality. In Table 33, the top 3 highest-scoring stakeholders for each of these metrics at each measurement point are presented.

Table 33: Stakeholders attributes – case study B

	Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
Degree	1. C2	1. C2	1. C2	1. C2	1. C2	1. C2
	2. P1	2. P1 & P2	2. P1 & P2	2. P2	2. P1 & P2	2. P1 & P2
	3. C3	3. C3	3. C3 & C4	3. C4	3. C4	3. C3 & C4
Betweenness	1. C2	1. C2	1. C2	1. C2	1. C2	1. C4
	2. C3	2. C3	2. P2	2. C4	2. C4	2. C2
	3. P1	3. P1	3. C3	3. P2	3. C3	3. C3
Closeness	1. C2	1. C2	1. C2	1. C2	1. C2	1. C2
	2. P1	2. P1	2. P1	2. P2	2. P1	2. C3 & P1
	3. C3	3. C3	3. C3 & P2	3. C4	3. C3	3. C4 & P2
Eigenvector	1. C2	1. C2	1. C2	1. C2	1. C2	1. C2
	2. P1	2. P2	2. P2	2. P2	2. P2	2. P2
	3. P2	3. P1	3. P1	3. P1	3. P3	3. P1

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.: Engineering, Constr.: construction; Complet.: Completion.
Stakeholders: C2: Program director (client), C3: Program manager internal, C4: Project management internal, P1: Program manager external, P2: Project management external

Attribute - Power

The power of a stakeholder can be assessed by combining the insights from all four centrality metrics. It can be observed that in the initiative phase, the program director (C2) and program manager external (P1) score high on all of these metrics, making them the most powerful stakeholders in this phase. The same holds for the program manager internal (C3), showing high scores on the first three metrics. In the preliminary design phase, the program director (C2), program manager internal (C3), and program manager external (P1) remain powerful. A new powerful stakeholder in this phase is the external project management (P2), showing high levels of both degree and eigenvector centrality. In the next phase, the final design, these same four stakeholders remain the most powerful stakeholders. In the engineering phase, the program director (C2) and external project management (P2) remain powerful. A new powerful stakeholder in this phase is the internal project management (C4). In the construction phase, the program director (C2), program manager internal (C3), and external project management (P2) are the most powerful stakeholders. Finally, at the completion of

the project, the same stakeholders apply with the addition of the project management internal (C4) and program manager external (P1). Table 34 lists the powerful stakeholders at each stage of the project, with the most powerful (high scores on a minimum of 3 out of 4 metrics) stakeholders in bold.

Table 34: Powerful stakeholders - Case study B

Phase	Powerful stakeholders	
Initiative	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Program manager external
Preliminary design	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Program manager external ▪ Project management external
Final design	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Program manager external ▪ Project management external
Engineering	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Project management external
Construction	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Project management external
Completion	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal ▪ Program manager external 	<ul style="list-style-type: none"> ▪ Project management external ▪ Project management internal

Attribute - Proximity

The attribute proximity can be assessed by means of the metric of closeness centrality (Chen et al., 2024). It can be observed that in the initiative phase, the program director (C2), program manager external (P2), and internal (C3) are the most proximate stakeholders within the network. In the preliminary design phase, this remains the same. From the final design phase is the external project management (P2) becoming a proximate stakeholder. Which remains to be a proximate stakeholder in the engineering phase, this also applies to the program director (C2). Additionally, the internal project management (C4) shows high levels of closeness centrality in this phase. During the construction phase, the same three stakeholders as in the initiative phase are the most proximate. Finally, in the completion phase, the program director (C2), program manager internal (C3), program manager external (P1), internal project management (C4), and external project management (P2) are the most proximate stakeholders. Table 35 lists the proximate stakeholders at each stage of the project.

Table 35: Proximate stakeholders - Case study B

Phase	Proximate stakeholders
Initiative	1. Program director (client) 2. Program manager external 3. Program manager internal
Preliminary design	1. Program director (client) 2. Program manager external 3. Project manager internal
Final design	1. Program director (client) 2. Program manager external 3. Program manager internal & project management external
Engineering	1. Program director (client) 2. Project management external 3. Project management internal
Construction	1. Program director (client) 2. Program manager external 3. Program manager internal
Completion	1. Program director (client) 2. Program manager internal & program manager external 3. Project management internal & project management external

SASF 2 - Assessing stakeholders' behaviors

Stakeholders' behavior can be divided into three categories: observed behavior, cooperative potential, and competitive threat. In where the observed behavior describes the present state of the relationships among stakeholders on the problem at hand (Freeman, 1984). This type of stakeholder behavior can be assessed by means of looking at present relationships in a network and the degree centrality of each node. As this study focuses on the dynamic component, the changes in stakeholder behavior are the main focus. Within this case study, three types of changes have been observed.

1. Dynamics of the number of nodes and ties

As the project progresses, the number of nodes (stakeholders) and the number of ties change over time; see Table 36. Beginning with the number of nodes, it can be observed that it increases from initiative up to final design. In the engineering phase, it drops after it increases in the construction phase, in which it tops out and stabilizes in the next phase. In terms of the number of ties, a similar pattern can be observed.

Table 36: Dynamics of the number of nodes and ties - Case study B

Phase	No. of nodes	No. of ties
Initiative	11	19
Preliminary design	16	30
Final design	20	33
Engineering	17	29
Construction	21	37
Completion	19	34

2. Shift in contractual party of architect and advisors

In the initiative phase, a contractual agreement is present between the architect and advisors with the program director. Whereas, from the preliminary design phase, they are part of the contract that the program director has with the contractor and thus have a contractual relationship with the contractor instead of the program director.

3. Changes in degree centrality of stakeholders

In terms of the degree centrality of stakeholders, also some dynamics can be observed; the most significant ones are the following:

- *Program director*: significant decrease from 0.560 in the initiative phase, where it peaks to 0.422 at completion.
- *Municipality*: significant decrease from 0.180 in the initiative phase to 0.090 in the construction phase.
- *Architect + advisors*: significant decrease from 0.160 in the initiative phase, where it peaks to 0.084 in the final design phase.
- *Contractor*: significant decrease from 0.213 in the preliminary design phase to 0.168 in the final design phase after increases again to 0.200 in the engineering phase.
- *Project management external*: significant decrease from 0.280 in the initiative phase to 0.200 in the construction phase.

SASF 3 - Analyzing conflicts and coalitions amongst stakeholders

Clusters can be identified by means of the metric modularity; see Figures 40 to 45 for the scores. The modularity scores are the lowest in the initiative phase, following an increase in the preliminary and final design phases. After this phase, the modularity scores decrease in the engineering phase, before increasing again during the construction phases, after it stabilizes. This pattern indicates clearer cluster formations as the project evolves, with the exception of the temporary decrease observed in the engineering phase.

In the initiative phase, four clusters can be observed: 1) municipality with internal parties, 2) program directors with the contracted parties, 3) the financial managers, and 4) the performance managers. In the preliminary design phase, the network can be divided into four clusters; the first two clusters are similar to the previous phase. The difference is that the performance and financial managers forms one cluster instead of two separate clusters. Additionally, there form a cluster around the communication experts with the future users. In the final design phase, a similar pattern can be observed, but in this phase the municipality is considered a separate cluster, and there is one additional cluster formed around the owner of the temporary housing. In the next phase, the engineering phase, the network can be divided into three clusters, wherein the municipality becomes part of the cluster with the internal parties. Moreover, it becomes the owner of the temporary housing part of the cluster of the program director with the contracted parties. The third cluster consists of the performance and financial managers with the internal program manager. Finally, in the last two phases (construction and completion), the network consists of five clusters, which are quite similar to each other.

However, in the construction phase, the owner of the temporary housing is a distinct formation, where this stakeholder is not present at the completion of the project. Furthermore, in the construction phase, the municipality is part of a broader cluster, while in the completion phase, this stakeholder forms a distinct cluster.

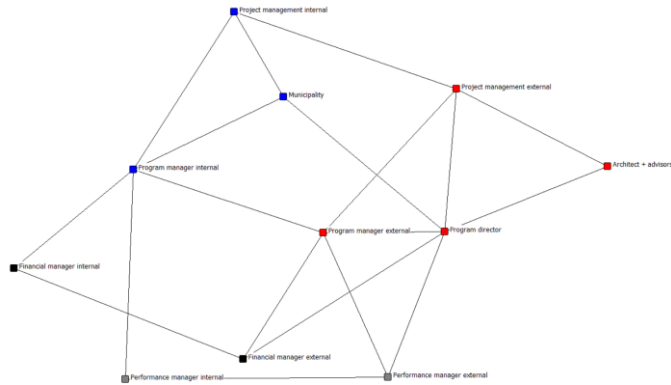


Figure 39: Stakeholder clusters initiative - Case study B

Partition w/ 4 clusters: Q = 0.208

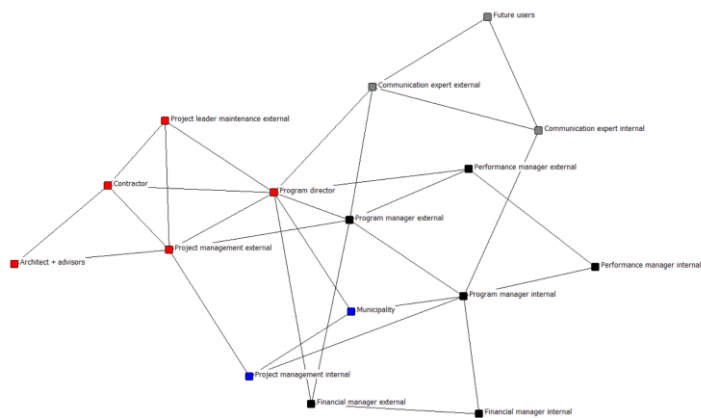


Figure 40: Stakeholder clusters preliminary design - Case study B

Partition w/ 4 clusters: Q = 0.319

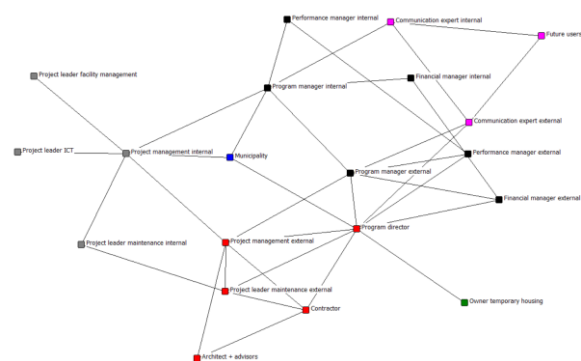


Figure 41: Stakeholder clusters final design - Case study B

Partition w/ 6 clusters: Q = 0.335

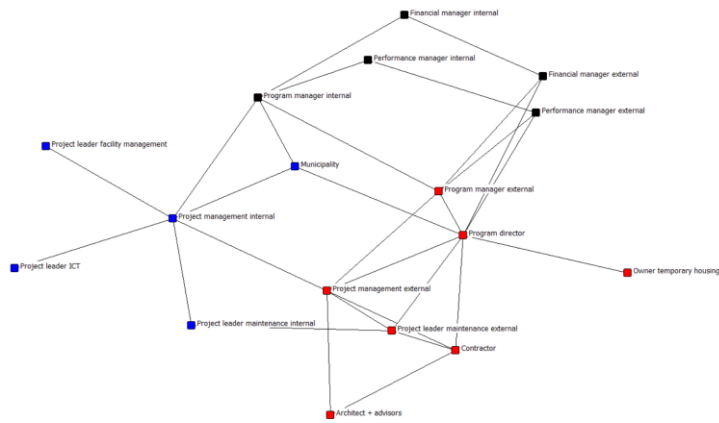


Figure 42: Stakeholder clusters engineering - Case study B

Partition w/ 3 clusters: $Q = 0.271$

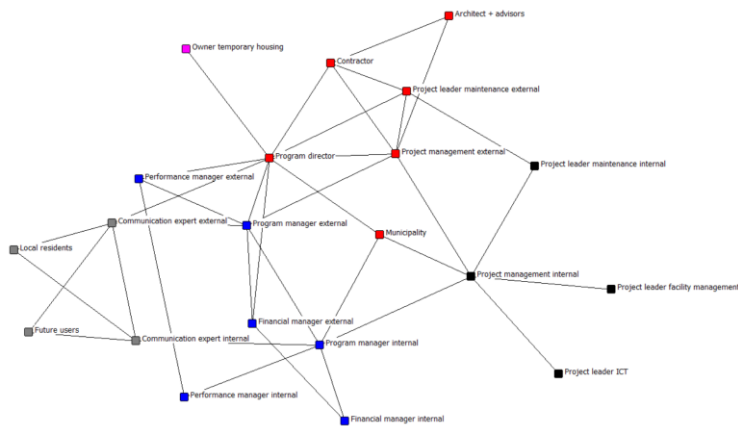


Figure 43: Stakeholder clusters construction - Case study B

Partition w/ 5 clusters: $Q = 0.368$

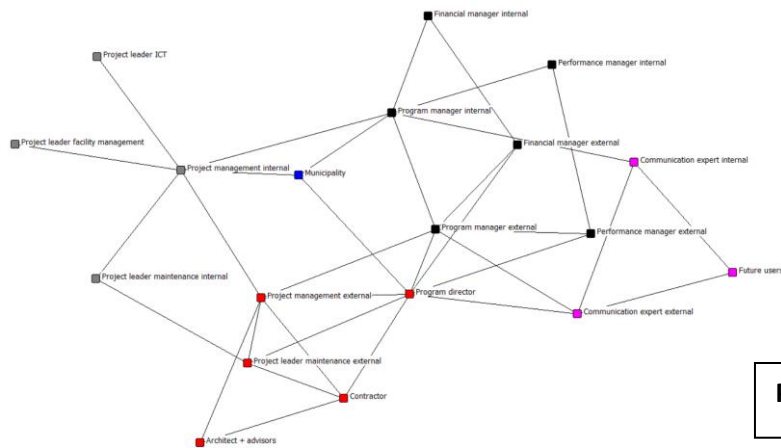


Figure 44: Stakeholder clusters completion - Case study B

Partition w/ 5 clusters: $Q = 0.347$

SASF 4 - Understanding areas of stakeholders' interests

Stakeholders' interests can be understood by combining the results of different SNA metrics research by Mok et al. (2017). First of all, the metric of network density offers information on how interconnected stakeholder interests are. In where a dense network structure suggests that the interests of several stakeholders are connected to one another. In Table 37, an overview is presented of how the density of the network evolves across the project life cycle. It can be observed that the density is the highest in the initiative phase, indicating the highest level of interest connectedness in this phase. In the preliminary design phase as well as in the final design phase, the density decreases in comparison to the previous phase. As of the final design phase the density levels fluctuate, reflecting the dynamics of interests connectedness in this part of the project.

Table 37: Density - Case study B

Phase	Density	Std Dev.
Initiative	0.345	0.467
Preliminary design	0.250	0.433
Final design	0.174	0.379
Engineering	0.213	0.410
Construction	0.176	0.381
Completion	0.199	0.399

Additionally, according to this paper, can the metrics of degree and betweenness centrality be used to identify the stakeholders interests with the highest influence. The interest of stakeholders with high degree centrality should receive more attention. On the other hand, betweenness centrality illustrates how powerful a stakeholder's interest is in regulating the flow of influence through a connection. They state that the complexity of stakeholder interests can be reduced by addressing core interests (high betweenness centrality). So overall, the focus should be on the interests of stakeholders with high degree and betweenness centrality. In Table 38, an overview is presented of the top 3 stakeholders with the highest degree and betweenness centrality at each stage of the project.

Table 38: Stakeholders' interests - Case study B

	Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
Degree	1. C2 2. P1 3. C3	1. C2 2. P1 & P2 3. C3	1. C2 2. P1 & P2 3. C3 & C4	1. C2 2. P2 3. C4	1. C2 2. P1 & P2 3. C4	1. C2 2. P1 & P2 3. C3 & C4
Betweenness	1. C2 2. C3 3. P1	1. C2 2. C3 3. P1	1. C2 2. P2 3. C3	1. C2 2. C4 3. P2	1. C2 2. C4 3. C3	1. C4 2. C2 3. C3

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.: Engineering, Constr.: construction; Complet.: Completion.
Stakeholders: C2: Program director (client), C3: Program manager internal, C4: Project management internal, P1: Program manager external, P2: Project management external

In the initiative phase, the program director (C2), program manager internal (C3), and program manager external (P1). These stakeholders remain to show high levels of degree centrality in the following two phases (preliminary and final design). In the preliminary design phase, external project management also shows high levels. This is also true for the final design phase, with the addition of internal project management (C4). In terms of betweenness centrality, the program director (C2) and program manager internal (C3) show high levels across all three phases. In the initiative and preliminary design phase, this also applies to the program manager external (P1). Whereas, in the final design phase, this is true for the external project management (P2). In the engineering phase, the same set of stakeholders are showing the highest levels of degree and betweenness centrality, namely the program director (C2), internal project management (C4), and external project management (P2). Finally, in the last two phases (construction and completion), these same stakeholders remain to show high levels of degree centrality. With the addition of the program manager external (P1) in both phases and the program manager internal (C3) in the completion phase. In terms of betweenness centrality, the same set of stakeholders shows the highest levels in both of the phases, namely program director (C2), program manager internal (C3), and internal project management (C4). On the basis of this information, a prioritization of stakeholders' interests can be made; see Table 39.

Table 39: Prioritization of stakeholders' interests – Case study B

Phase	Prioritization of stakeholders' interests	
Initiative	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Program manager external
Preliminary design	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Program manager external ▪ Project management external
Final design	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Program manager external ▪ Project management external ▪ Project management internal
Engineering	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Project management external
Construction	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Program manager external ▪ Project management external ▪ Project management internal
Completion	<ul style="list-style-type: none"> ▪ Program director (client) ▪ Program manager internal 	<ul style="list-style-type: none"> ▪ Program manager external ▪ Project management external ▪ Project management internal

SASF 5 - Predicting the influence of stakeholders accurately

By combining the results from the three centrality metrics of degree, betweenness, and closeness centrality, the level of influence for each of the stakeholders can be calculated. The focus will be on identifying the stakeholders with the highest levels of influence at each measurement point, highlighting the most influential actors within the network. An overview of the top 3 most influential stakeholders at each measurement point is presented in Table 40. On the basis of this overview, a few conclusions can be drawn. The most influential stakeholder in the initiative phase is the program director (C2), who is the formal client of this project. This position does hold during the whole project life cycle. This is followed by the program manager external (P1) and the program manager internal (C3). The same set of stakeholders applies to the preliminary design phase. In the next phase, the final design, a similar set of stakeholders once again can be noted, with the exception that the second position of the program manager external (P1) is taken by the internal project management (C4). In the engineering phase, the external program manager (P1) becomes influential again and takes the third spot. In the construction phase, project managers are gaining more influence again. Observing the internal project management (C4) taking the second spot, while the third spot is taken by the external project management (P2). Finally, in the completion phase, internal project management (C4) remains in second place, without sharing it with the program manager internal (C3), who drops to the third place.

Table 40: Stakeholders influence - Case study B

Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
1. C2	1. C2	1. C2	1. C2	1. C2	1. C2
2. P1	2. P1	2. C4	2. C4	2. C3 & C4	2. C4
3. C3	3. C3	3. C3	3. P1	3. P2	3. C3

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.; Engineering, Constr.: construction; Complet.: Completion.
Stakeholders: C2: Program director (client), C3: Program manager internal, C4: Project management internal, P1: Program manager external, P2: Project management external

Case study C

SASF 1 - Assessing attributes of stakeholders

The three stakeholder attributes of power and proximity can be determined by using four centrality metrics: degree, betweenness, closeness, and eigenvector centrality. In Table 41, the top 3 highest-scoring stakeholders for each of these metrics at each measurement point are presented.

Table 41: Stakeholders attributes - Case study C

	Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
Degree	1. C3	1. C3	1. C3	1. C3	1. C3	1. C3
	2. C5	2. P1	2. P1	2. P1	2. P1	2. P1
	3. C4	3. C5	3. C5	3. P5	3. P5	3. P4
Betweenness	1. C3	1. C5	1. C3	1. C3	1. C3	1. C3
	2. C5	2. C3	2. C5	2. C5	2. P1	2. P1
	3. C4	3. P1	3. P1	3. P1	3. C5	3. C5
Closeness	1. C3	1. C3 &	1. C3	1. C3	1. C3	1. C3
	2. C4	P1	2. P1	2. P1	2. P1	2. P1
	3. P1	2. C4 &	3. C4	3. C4	3. P3 &	3. P3,
		C5			P5	P4 &
		3. P2, P3,				P5
		P6 & E7				
Eigenvector	1. C3	1. C3	1. C3	1. C3	1. C3	1. C3
	2. P1	2. P1	2. P1	2. P1 &	2. P1	2. P1
	3. E1	3. P2, P3,	3. P3	P5	3. P5	3. P5
		P6		3. P3		

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.: Engineering, Constr.: construction; Complet.: Completion.
Stakeholders: C3: Executive board (client), C4: Steering committee, C5: Project management internal, P1: Project management external, P2: Concept developer, P3: Architect + advisors, P4: Contractor, P5: Co-contractors, P6: Specialist advisors, E1: Municipality, E7: Future users.

Attribute - Power

The power of a stakeholder can be assessed by combining the insights from all four centrality metrics. It can be observed that in the initiative phase, the executive board (C3) scores high on all of these metrics, making it the most powerful stakeholder in this phase, which remains during the rest of the project life cycle (preliminary design-completion). In addition, the steering committee (C4), internal (C5), and external project management (P1) are also powerful stakeholders in the initiative phase. As the municipality (E1) only shows high levels of eigenvector centrality, their power is limited. In the preliminary design phase, most of the stakeholders remain powerful with the exception of the steering committee (C4). New powerful stakeholders in this phase are concept developer (P2), architect + advisors (P3), and specialist advisors (P6). In the final design phase, these new stakeholders are no longer powerful (P2, P3, and P6), leaving three remaining stakeholders (C3, C5, and P1). From the engineering phase onwards, co-contractors (P5) become a powerful stakeholder, which remains so until completion, replacing internal project management (C5). The rest of the powerful stakeholders are the same as in the previous phase.

This set of powerful stakeholders remains the same till completion, with the addition of the contractor (P4) in the completion phase of the project. Table 42 lists the powerful stakeholders at each stage of the project, with the most powerful (high scores on a minimum of 3 out of 4 metrics) stakeholders in bold.

Table 42: Powerful stakeholders - Case study C

Phase	Powerful stakeholders	
Initiative	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management external 	<ul style="list-style-type: none"> ▪ Steering committee ▪ Project management internal
Preliminary design	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Architect + advisors ▪ Concept developer 	<ul style="list-style-type: none"> ▪ Project management external ▪ Project management internal ▪ Specialist advisors
Final design	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Project management external
Engineering	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Co-contractors 	<ul style="list-style-type: none"> ▪ Project management external
Construction	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Co-contractors 	<ul style="list-style-type: none"> ▪ Project management external
Completion	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Co-contractors 	<ul style="list-style-type: none"> ▪ Project management external ▪ Contractor

Attribute - Proximity

The attribute proximity can be assessed by means of the metric of closeness centrality (Chen et al., 2024). It can be observed that in the initiative phase, the executive board (C3), steering committee (C4), and project management external (P1) are the most proximate stakeholders within the network. In the preliminary design and final design phase, the executive board (C3), steering committee (C4), and project management external (P1) remain closely positioned within the network. Additionally, the project management internal (C5), concept developer (P2), architect and advisors (P3), specialist advisors (P6), and future users (E7) are showing high levels of closeness centrality in the preliminary design phase. In the engineering phase, these new proximate stakeholders lose their position, leaving three stakeholders (C3, C4, and P1). From the construction phase till completion, four stakeholders stay closely positioned within the network: executive board (C3), project management external (P1), architect and advisors (P3), and co-contractors (P5). In addition to these four stakeholders, the contractor is also a proximate stakeholder in the completion phase. Table 43 lists the proximate stakeholders at each stage of the project.

Table 43: Proximate stakeholders - Case study C

Phase	Proximate stakeholders
Initiative	<ol style="list-style-type: none"> 1. Executive board (client) 2. Steering committee 3. Project management external
Preliminary design	<ol style="list-style-type: none"> 1. Executive board (client) & project management external 2. Steering committee & project management internal 3. Concept developer, architect + advisors, specialist advisors & future users
Final design	<ol style="list-style-type: none"> 1. Executive board (client) 2. Project management external 3. Steering committee
Engineering	<ol style="list-style-type: none"> 1. Executive board (client) 2. Project management external 3. Steering committee
Construction	<ol style="list-style-type: none"> 1. Executive board (client) 2. Project management external 3. Architect + advisors & co-contractors
Completion	<ol style="list-style-type: none"> 1. Executive board (client) 2. Project management external 3. Architect + advisors, contractor & co-contractors

SASF 2 - Assessing stakeholders' behaviors

Stakeholders' behavior can be divided into three categories: observed behavior, cooperative potential, and competitive threat. In where the observed behavior describes the present state of the relationships among stakeholders on the problem at hand (Freeman, 1984). This type of stakeholder behavior can be assessed by means of looking at present relationships in a network and the degree centrality of each node. As this study focuses on the dynamic component, the changes in stakeholder behavior are the main focus. Within this case study, three types of changes have been observed.

1. Dynamics of the number of nodes and ties

As the project progresses, the number of nodes (stakeholders) and the number of ties change over time; see Table 44. Beginning with the number of nodes, it can be observed that it decreases from initiative to preliminary after increases increase again. With the highest number of nodes in the engineering phase. After this phase, it drops again, following stabilization. In terms of the number of ties, it increases from preliminary design to the engineering phase after it drops and stabilizes.

Table 44: Dynamics of the number of nodes and ties - Case study C

Phase	No. of nodes	No. of ties
Initiative	15	18
Preliminary design	13	17
Final design	17	25
Engineering	21	35
Construction	17	29
Completion	17	31

2. Shift from contractual to hierarchy

There is a contractual relationship between the executive board and the municipality in the initiative phase, as the municipality is the landowner in this case. Whereas this shifts to a hierarchical relationship from the preliminary design phase on till completion, since the environmental permit, for instance, needs to be approved by the municipality.

3. Changes in degree centrality of stakeholders

In terms of the degree centrality of stakeholders, also some dynamics can be observed; the most significant ones are the following:

- *Executive board*: significant increase from 0.443 in the initiative phase to 0.625 in the construction phase, where it tops out after it drops to 0.588 in the completion phase.
- *Project management external*: significant increase from 0.114 in the initiative phase to 0.283 in the preliminary design phase after it drops in the final design phase to 0.213, after it increases again and peaks at 0.350 at the construction phase.
- *Contractor*: significant increase from 0.160 in the engineering phase to 0.263 in the completion phase.
- *Municipality*: significant decrease from 0.114 in the initiative phase where it tops out to 0.050 in the preliminary design phase after it rebounds to 0.113 in the completion phase.
- *Architect + advisors*: significant increase from 0.133 in the preliminary design phase to 0.213 in the construction and completion phase.
- *Utility company*: significant increase from 0.100 in the final design phase to 0.138 in the construction and completion phase.

SASF 3 - Analyzing conflicts and coalitions amongst stakeholders

Clusters can be identified by means of the metric modularity; see Figures 46 to 51 for the scores. It can be seen that the modularity scores are the highest in the initiative phase, following a decrease in the preliminary design phase. Thus meaning the clearest cluster formation at the beginning of the project. In the following phases (final design-completion) the modularity scores continuously fluctuate.

In the initiative phase, three clusters can be observed: 1) internal departments and external project management, 2) executive board with supervisory entities and the remaining contractual parties, and 3) governance bodies. In the preliminary design phase, there are five clusters: 1) internal departments client, 2) executive board with contractual parties, 3) steering committee with the future users, 4) municipality, and 5) surrounding companies. In the final design phase, six clusters can be observed. The basis is similar to the previous phase with the differences that the executive board becomes part of the cluster of the governance bodies and that there forms a distinct cluster consisting of the architect and advisors with the utility company and the external project management with the specialist advisors and the concept developer. In the next phase, the engineering phase, the network also consists of six clusters. It is similar to the previous phase but different in regards to two new clusters of the supervisory board and shareholder.

Moreover, the clusters of the architect and advisors and the one of the external project management described in the previous phase are forming one cluster. Finally, the cluster formations in the last two phases are similar to each other, with the difference that in the completion phase the surrounding companies are not a cluster anymore.



Figure 45: Stakeholder clusters initiative - Case study C

Partition w/ 3 clusters: Q = 0.360

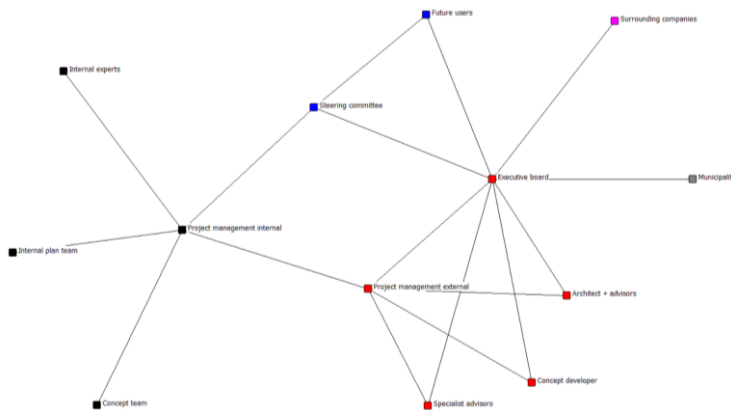


Figure 46: Stakeholder clusters preliminary design - Case study C

Partition w/ 5 clusters: Q = 0.256

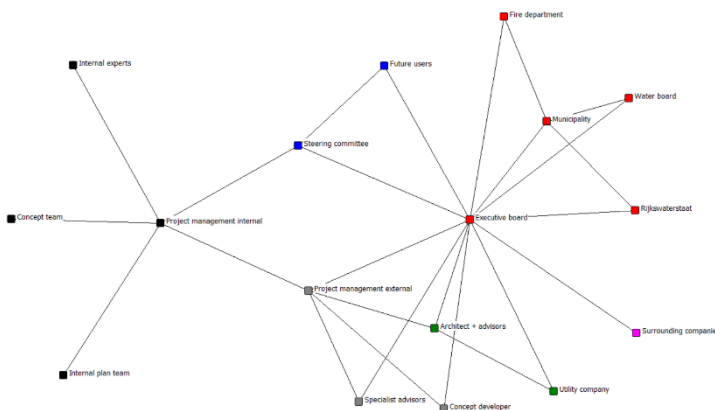
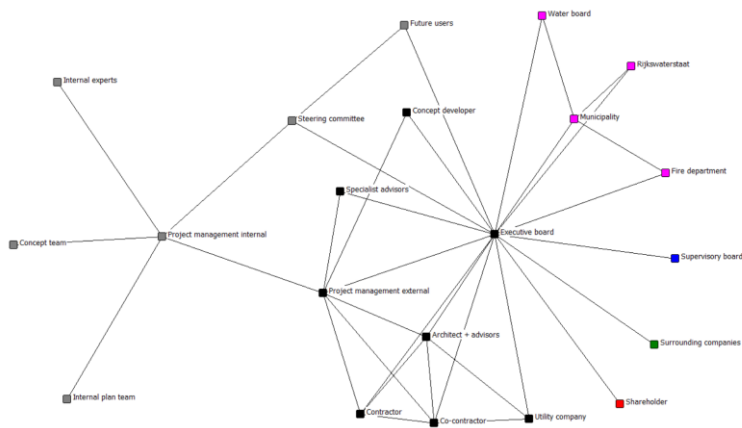


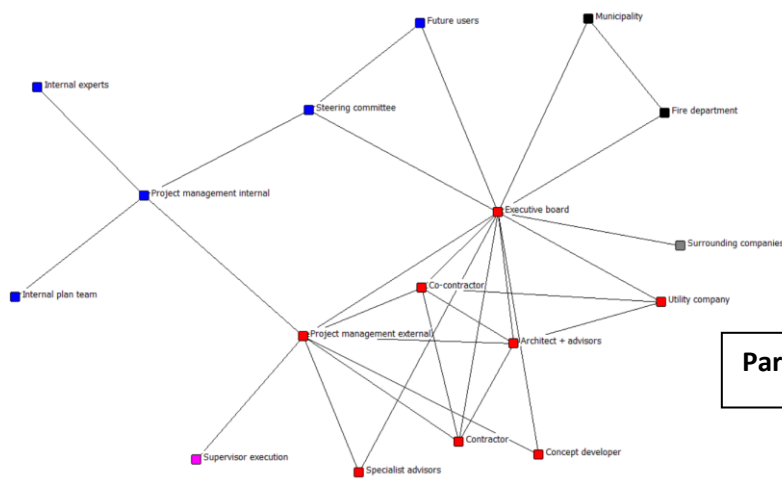
Figure 47: Stakeholder clusters final design - Case study C

Partition w/ 6 clusters: Q = 0.288



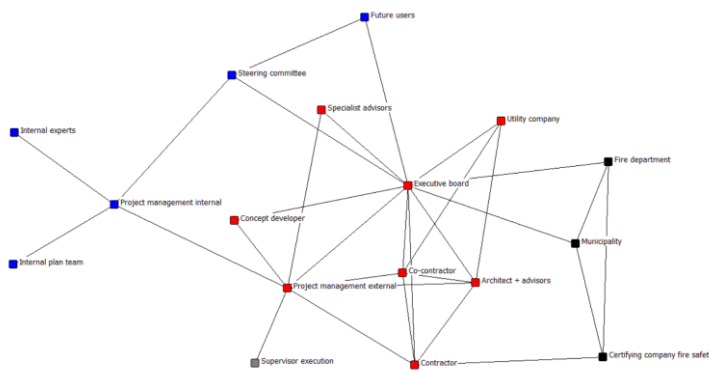
Partition w/ 6 clusters: $Q = 0.264$

Figure 48: Stakeholder clusters engineering - Case study C



Partition w/ 5 clusters: $Q = 0.218$

Figure 49: Stakeholder clusters construction - Case study C



Partition w/ 4 clusters: $Q = 0.284$

Figure 50: Stakeholder clusters completion - Case study C

SASF 4 - Understanding areas of stakeholders' interests

Stakeholders' interests can be understood by combining the results of different SNA metrics research by Mok et al. (2017). First of all, the metric of network density offers information on how interconnected stakeholder interests are. In where a dense network structure suggests that the interests of several stakeholders are connected to one another. In Table 45, an overview is presented of how the density of the network evolves across the project life cycle. It can be observed that the density is the lowest in the engineering phase, indicating the lowest level of interest connectedness in this phase. From the start of the project, the density increases, followed by a decrease in the next two phases (final design and engineering). As of the construction phase, density increases again and tops out in the completion phase. Thus reflecting the highest level of interest connectedness in this phase.

Table 45: Density - Case study C

Phase	Density	Std Dev.
Initiative	0.171	0.377
Preliminary design	0.218	0.413
Final design	0.184	0.387
Engineering	0.167	0.373
Construction	0.213	0.410
Completion	0.228	0.420

Additionally, according to this paper, can the metrics of degree and betweenness centrality be used to identify the stakeholders interests with the highest influence. The interest of stakeholders with high degree centrality should receive more attention. On the other hand, betweenness centrality illustrates how powerful a stakeholder's interest is in regulating the flow of influence through a connection. They state that the complexity of stakeholder interests can be reduced by addressing core interests (high betweenness centrality). So overall, the focus should be on the interests of stakeholders with high degree and betweenness centrality. In Table 46, an overview is presented of the top 3 stakeholders with the highest degree and betweenness centrality at each stage of the project.

Table 46: Stakeholders' interests - Case study B

	Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
Degree	1. C3	1. C3	1. C3	1. C3	1. C3	1. C3
	2. C5	2. P1	2. P1	2. P1	2. P1	2. P1
	3. C4	3. C5	3. C5	3. P5	3. P5	3. P4
Betweenness	1. C3	1. C5	1. C3	1. C3	1. C3	1. C3
	2. C5	2. C3	2. C5	2. C5	2. P1	2. P1
	3. C4	3. P1	3. P1	3. P1	3. C5	3. C5

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design; Eng.: Engineering, Constr.: construction; Compl.: Completion.
Stakeholders: C3: Executive board (client), C4: Steering committee, C5: Project management internal, P1: Project management external, P4: Contractor, P5: Co-contractors.

In the initiative phase, the executive board (C3), project management internal (C5), and the steering committee (C4) are showing the highest levels of degree as well as betweenness centrality. In the next two phases (preliminary and final design), a similar set of stakeholders are showing the highest levels of degree and betweenness centrality. But with the difference that project management external (P1) is replacing the steering committee (C4). In the engineering and construction phase, the executive board (C3), project management external (P1), and co-contractors (P5) are showing the highest levels of degree centrality. In terms of betweenness centrality, a similar set of stakeholders can be observed, but with the difference that project management internal (C5) shows high levels instead of the co-contractors (P5). These stakeholders does also show the highest levels of betweenness centrality in the completion phase. Finally, in terms of degree centrality, the executive board (C3), project management external (P1), and contractor (P4) show the highest levels in the completion phase. On the basis of this information, a prioritization of stakeholders' interests can be made; see Table 47.

Table 47: Prioritization of stakeholders' interests – Case study C

Phase	Prioritization of stakeholders' interests	
Initiative	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Steering committee 	<ul style="list-style-type: none"> ▪ Project management internal
Preliminary design	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management external 	<ul style="list-style-type: none"> ▪ Project management internal
Final design	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management external 	<ul style="list-style-type: none"> ▪ Project management internal
Engineering	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Project management external ▪ Co-contractors
Construction	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Project management external ▪ Co-contractors
Completion	<ul style="list-style-type: none"> ▪ Executive board (client) ▪ Project management internal 	<ul style="list-style-type: none"> ▪ Project management external ▪ Contractor

SASF 5 - Predicting the influence of stakeholders accurately

By combining the results from the three centrality metrics of degree, betweenness, and closeness centrality, the level of influence for each of the stakeholders can be calculated. The focus will be on identifying the stakeholders with the highest levels of influence at each measurement point, highlighting the most influential actors within the network. An overview of the top 3 most influential stakeholders at each measurement point is presented in Table 48. On the basis of this overview, a few conclusions can be drawn. The most influential stakeholders in the initiative phase are the executive board (C3), who is the formal client of this project. This is followed by the project management internal (C5), from the client side and the steering committee (C4). As from the preliminary design phase onwards, the three most influential stakeholders remain the same, namely the executive board (C3), project management internal (C5), and project management external (P1). However, does the internal project management (P1) become the second most influential stakeholder from the final design phase, swapping positions with the internal project management (C5).

Table 48: Stakeholders influence - Case study C

Init.	Prel. Des.	Fin. Des.	Eng.	Constr.	Compl.
1. C3	1. C3	1. C3	1. C3	1. C3	1. C3
2. C5	2. C5	2. P1	2. P1	2. P1	2. P1
3. C4	3. P1	3. C5	3. C5	3. C5	3. C5

Legend

Phases: Init.: Initiative, Prel. Des.: Preliminary design, Fin. Des.: Final design, Eng.: Engineering, Constr.: construction, Complet.: Completion.

Stakeholders: C3: Executive board (client), C4: Steering committee, C5: Project management internal, P1: Project management external

Appendix F – UCINET results

Case study A

Initiative

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Supervisory Board (C1)	0.043	0.438	0.210	0	0.067
Executive Board (C2)	0.471	0.737	0.901	0.540	0.125
Academy Directors (C3)	0.100	0.560	0.338	0.031	0.108
Sounding board academies (C4)	0.043	0.438	0.120	0	0.067
Department of property and facility management (C5)	0.043	0.438	0.120	0	0.067
Project management internal (C6)	0.329	0.737	0.517	0.584	0.117
Internal experts (C7)	0.043	0.438	0.120	0	0.067
Internal procurement department (C8)	0.043	0.438	0.120	0	0.067
Project management external (P1)	0.071	0.438	0.350	0	0.075
Current building owner (E1)	0.086	0.538	0.390	0	0.100
Municipality (E3)	0.086	0.538	0.390	0	0.100
Other educational institutions in the municipality (E5)	0.029	0.452	0.096	0	0.058
Current user (E7)	0.114	0.467	0.238	0.027	0.092
Housing corporation (E8)	0.114	0.467	0.302	0.026	0.083
Public financier (E9)	0.071	0.438	0.350	0	0.075

Preliminary design

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Supervisory Board (C1)	0.038	0.432	0.194	0	0.059
Executive Board (C2)	0.400	0.727	0.868	0.446	0.105
Academy Directors (C3)	0.100	0.571	0.324	0.063	0.098
Sounding board academies (C4)	0.038	0.444	0.116	0	0.065
Department of property and facility management (C5)	0.038	0.444	0.116	0	0.065
Project management internal (C6)	0.288	0.762	0.519	0.646	0.111
Internal experts (C7)	0.038	0.444	0.116	0	0.065
Project management external (P1)	0.100	0.444	0.445	0	0.078
Architect + advisors (P2)	0.138	0.552	0.540	0.029	0.092
Current building owner (E1)	0.013	0.444	0.039	0	0.046
Future users (E2)	0.013	0.444	0.039	0	0.046
Municipality (E3)	0.088	0.552	0.300	0	0.085
Other HBO institutions in the Netherlands (E4)	0.025	0.444	0.089	0	0.052
Other educational institutions in the municipality (E5)	0.025	0.444	0.089	0	0.052
Local residents (E6)	0.013	0.444	0.039	0	0.046
Public financier (E9)	0.063	0.432	0.324	0	0.072
Fire department (E10)	0.088	0.552	0.300	0	0.085

Final design

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Supervisory Board (C1)	0.035	0.425	0.153	0	0.058
Executive Board (C2)	0.424	0.708	0.816	0.365	0.099
Academy Directors (C3)	0.082	0.548	0.252	0.029	0.088
Sounding board academies (C4)	0.035	0.459	0.095	0	0.070
Department of property and facility management (C5)	0.035	0.459	0.095	0	0.070
Project management internal (C6)	0.341	0.81	0.506	0.699	0.105
Internal experts (C7)	0.035	0.459	0.095	0	0.070
Internal procurement department (C8)	0.035	0.459	0.095	0	0.070
Project management external (P1)	0.129	0.447	0.455	0	0.076
Architect + advisors (P2)	0.165	0.567	0.535	0.020	0.094
Interior architect (P3)	0.165	0.567	0.535	0.020	0.094
Current building owner (E1)	0.012	0.459	0.032	0	0.064
Future users (E2)	0.012	0.459	0.032	0	0.064
Municipality (E3)	0.082	0.548	0.227	0	0.082
Other educational institutions in the municipality (E5)	0.024	0.436	0.067	0	0.058
Local residents (E6)	0.012	0.459	0.032	0	0.064
Public financier (E9)	0.059	0.425	0.255	0	0.064
Fire department (E10)	0.082	0.548	0.227	0	0.082

Engineering

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Supervisory Board (C1)	0.060	0.500	0.134	0.000	0.045
Executive Board (C2)	0.780	0.909	0.806	0.539	0.167
Academy Directors (C3)	0.120	0.526	0.206	0.000	0.076
Project management internal (C6)	0.320	0.714	0.431	0.111	0.136
Project management external (P1)	0.280	0.625	0.473	0.011	0.106
Architect + advisors (P2)	0.340	0.667	0.534	0.017	0.121
Interior architect (P3)	0.280	0.588	0.463	0.006	0.091
Contractor (P4)	0.380	0.667	0.501	0.206	0.152
Sub-contractors (P5)	0.100	0.417	0.139	0.000	0.045
Current building owner (E1)	0.120	0.526	0.247	0.000	0.076
Public financier (E9)	0.100	0.500	0.223	0.000	0.061

Construction

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Supervisory Board (C1)	0.040	0.441	0.132	0	0.044
Executive Board (C2)	0.533	0.750	0.795	0.369	0.118
Academy Directors (C3)	0.080	0.517	0.207	0	0.066
Department of property and facility management (C5)	0.040	0.455	0.075	0	0.051
Project management internal (C6)	0.307	0.789	0.451	0.548	0.110
Project management external (P1)	0.187	0.500	0.467	0.005	0.081
Architect + advisors (P2)	0.227	0.600	0.531	0.017	0.096
Interior architect (P3)	0.187	0.556	0.460	0.012	0.088
Contractor (P4)	0.253	0.600	0.498	0.145	0.103
Sub-contractors (P5)	0.067	0.385	0.138	0	0.029
Current building owner (E1)	0.013	0.455	0.025	0	0.037
Future users (E2)	0.013	0.455	0.025	0	0.037
Municipality (E3)	0.093	0.536	0.188	0	0.074
Local residents (E6)	0.013	0.455	0.025	0	0.037
Public financier (E9)	0.067	0.441	0.220	0	0.059
Fire department (E10)	0.093	0.536	0.188	0	0.074

Completion

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Executive Board (C2)	0.529	0.737	0.787	0.272	0.117
Academy Directors (C3)	0.086	0.519	0.208	0	0.067
Department of property and facility management (C5)	0.043	0.467	0.076	0	0.058
Project management internal (C6)	0.329	0.824	0.457	0.588	0.125
Project manager external (P1)	0.200	0.500	0.472	0.005	0.083
Architect + advisors (P2)	0.243	0.609	0.537	0.019	0.100
Interior architect (P3)	0.200	0.560	0.465	0.014	0.092
Contractor (P4)	0.271	0.609	0.504	0.157	0.108
Sub-contractors (P5)	0.071	0.389	0.141	0	0.042
Current building owner (E1)	0.014	0.467	0.025	0	0.050
Future users (E2)	0.014	0.467	0.025	0	0.050
Municipality (E3)	0.100	0.538	0.189	0	0.075
Local residents (E6)	0.014	0.467	0.025	0	0.050
Public financier (E9)	0.071	0.438	0.220	0	0.058
Fire department (E10)	0.100	0.538	0.189	0	0.075

Case study B

Initiative

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Municipality (C1)	0.180	0.588	0.258	0.037	0.091
Program director (C2)	0.560	0.714	0.823	0.273	0.167
Program manager internal (C3)	0.300	0.625	0.266	0.218	0.136
Project management internal (C4)	0.180	0.526	0.206	0.039	0.076
Financial manager internal (C7)	0.120	0.476	0.137	0.021	0.045
Performance manager internal (C8)	0.120	0.476	0.137	0.021	0.045
Program manager external (P1)	0.340	0.667	0.596	0.151	0.152
Project management external (P2)	0.280	0.556	0.508	0.084	0.121
Architect + advisors (P4)	0.160	0.476	0.375	0.000	0.061
Financial manager external (P5)	0.220	0.526	0.420	0.078	0.106
Performance manager external (P6)	0.220	0.526	0.420	0.078	0.106

Preliminary design

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Municipality (C1)	0.120	0.517	0.192	0.020	0.066
Program director (C2)	0.507	0.682	0.817	0.333	0.118
Program manager internal (C3)	0.240	0.556	0.185	0.209	0.103
Project management internal (C4)	0.120	0.484	0.148	0.035	0.059
Financial manager internal (C7)	0.080	0.417	0.085	0.011	0.037
Performance manager internal (C8)	0.080	0.417	0.085	0.011	0.037
Communication expert internal (C10)	0.093	0.441	0.087	0.054	0.044
Program manager external (P1)	0.267	0.625	0.508	0.159	0.110
Project management external (P2)	0.267	0.536	0.509	0.152	0.096
Contractor (P3)	0.213	0.484	0.434	0.031	0.081
Architect + advisors (P4)	0.107	0.366	0.206	0.000	0.029
Financial manager external (P5)	0.147	0.469	0.327	0.053	0.074
Performance manager external (P6)	0.147	0.469	0.327	0.053	0.074
Project leader maintenance external (P7)	0.147	0.469	0.385	0.000	0.051
Communication expert external (P8)	0.160	0.500	0.328	0.134	0.088
Future users (E2)	0.027	0.385	0.023	0.000	0.029

Final design

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Municipality (C1)	0.095	0.514	0.189	0.037	0.057
Program director (C2)	0.453	0.613	0.830	0.345	0.095
Program manager internal (C3)	0.190	0.528	0.175	0.217	0.086
Project management internal (C4)	0.190	0.514	0.162	0.267	0.090
Project leader ICT (C5)	0.032	0.345	0.026	0.000	0.029
Project leader facility management (C6)	0.032	0.345	0.026	0.000	0.029
Financial manager internal (C7)	0.063	0.396	0.080	0.009	0.038
Performance manager internal (C8)	0.063	0.396	0.080	0.009	0.038
Project leader maintenance internal (C9)	0.063	0.404	0.089	0.010	0.043
Communication expert internal (C10)	0.074	0.413	0.081	0.050	0.048
Program manager external (P1)	0.211	0.543	0.486	0.114	0.076
Project management external (P2)	0.211	0.528	0.491	0.163	0.081
Contractor (P3)	0.168	0.463	0.419	0.024	0.062
Architect + advisors (P4)	0.084	0.358	0.193	0.000	0.033
Financial manager external (P5)	0.116	0.422	0.316	0.039	0.052
Performance manager external (P6)	0.116	0.422	0.316	0.039	0.052
Project leader maintenance external (P7)	0.147	0.463	0.386	0.048	0.067
Communication expert external (P8)	0.126	0.442	0.317	0.097	0.071
Future users (E2)	0.021	0.352	0.022	0.000	0.024
Owner temporary housing (E3)	0.053	0.388	0.224	0.000	0.033

Engineering

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Municipality (C1)	0.113	0.533	0.201	0.047	0.065
Program director (C2)	0.475	0.615	0.819	0.332	0.111
Program manager internal (C3)	0.188	0.516	0.174	0.162	0.092
Project management internal (C4)	0.225	0.552	0.183	0.314	0.105
Project leader ICT (C5)	0.038	0.364	0.031	0.000	0.026
Project leader facility management (C6)	0.038	0.364	0.031	0.000	0.026
Financial manager internal (C7)	0.075	0.400	0.085	0.011	0.046
Performance manager internal (C8)	0.075	0.400	0.085	0.011	0.046
Project leader maintenance internal (C9)	0.075	0.432	0.103	0.014	0.052
Program manager external (P1)	0.213	0.533	0.465	0.094	0.085
Project management external (P2)	0.250	0.571	0.531	0.205	0.098
Contractor (P3)	0.200	0.485	0.458	0.027	0.072
Architect + advisors (P4)	0.100	0.381	0.221	0.000	0.039
Financial manager external (P5)	0.138	0.432	0.327	0.051	0.059
Performance manager external (P6)	0.138	0.432	0.327	0.051	0.059

Project leader maintenance external (P7)	0.175	0.485	0.419	0.056	0.078
Owner temporary housing (E3)	0.063	0.390	0.233	0.000	0.033

Construction

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Municipality (C1)	0.090	0.500	0.189	0.033	0.061
Program director (C2)	0.430	0.606	0.830	0.343	0.091
Program manager internal (C3)	0.180	0.526	0.175	0.227	0.087
Project management internal (C4)	0.180	0.500	0.161	0.254	0.087
Project leader ICT (C5)	0.030	0.339	0.026	0.000	0.026
Project leader facility management (C6)	0.030	0.339	0.026	0.000	0.026
Financial manager internal (C7)	0.060	0.392	0.080	0.008	0.043
Performance manager internal (C8)	0.060	0.392	0.080	0.008	0.043
Project leader maintenance internal (C9)	0.060	0.392	0.089	0.009	0.048
Communication expert internal (C10)	0.080	0.426	0.082	0.085	0.056
Program manager external (P1)	0.200	0.541	0.486	0.112	0.078
Project management external (P2)	0.200	0.513	0.491	0.150	0.082
Contractor (P3)	0.160	0.455	0.418	0.023	0.065
Architect + advisors (P4)	0.080	0.351	0.193	0.000	0.035
Financial manager external (P5)	0.110	0.417	0.316	0.035	0.052
Performance manager external (P6)	0.110	0.417	0.316	0.035	0.052
Project leader maintenance external (P7)	0.140	0.455	0.386	0.046	0.069
Communication expert external (P8)	0.130	0.455	0.319	0.143	0.074
Local residents (E1)	0.020	0.357	0.022	0.000	0.030
Future users (E2)	0.020	0.357	0.022	0.000	0.030
Owner temporary housing (E3)	0.050	0.385	0.224	0.000	0.039

Completion

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Municipality (C1)	0.100	0.514	0.195	0.028	0.063
Program director (C2)	0.422	0.600	0.810	0.268	0.100
Program manager internal (C3)	0.200	0.545	0.187	0.242	0.089
Project management internal (C4)	0.200	0.529	0.173	0.285	0.095
Project leader ICT (C5)	0.033	0.353	0.029	0.000	0.032
Project leader facility management (C6)	0.033	0.353	0.029	0.000	0.032
Financial manager internal (C7)	0.067	0.400	0.085	0.010	0.042
Performance manager internal (C8)	0.067	0.400	0.085	0.010	0.042
Project leader maintenance internal (C9)	0.067	0.409	0.095	0.011	0.047
Communication expert internal (C10)	0.078	0.419	0.086	0.056	0.053
Program manager external (P1)	0.222	0.545	0.501	0.124	0.079

Project management external (P2)	0.222	0.529	0.509	0.169	0.084
Contractor (P3)	0.178	0.462	0.432	0.024	0.068
Architect + advisors (P4)	0.089	0.360	0.204	0.000	0.037
Financial manager external (P5)	0.122	0.419	0.322	0.037	0.058
Performance manager external (P6)	0.122	0.419	0.322	0.037	0.058
Project leader maintenance external (P7)	0.156	0.462	0.397	0.047	0.074
Communication expert external (P8)	0.133	0.439	0.324	0.095	0.074
Future users (E2)	0.022	0.353	0.023	0.000	0.026

Case study C

Initiative

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Shareholder (C1)	0.043	0.400	0.240	0.000	0.067
Supervisory board (C2)	0.043	0.400	0.240	0.000	0.067
Executive board (C3)	0.443	0.636	0.927	0.725	0.125
Steering committee (C4)	0.129	0.538	0.404	0.220	0.108
Project management internal (C5)	0.214	0.452	0.285	0.401	0.117
Concept team (C6)	0.043	0.318	0.074	0.000	0.058
Internal plan team (C7)	0.043	0.318	0.074	0.000	0.058
Internal experts (C8)	0.043	0.318	0.074	0.000	0.058
Project management external (P1)	0.114	0.519	0.475	0.176	0.100
Municipality (E1)	0.114	0.452	0.452	0.148	0.092
Province (E2)	0.014	0.318	0.039	0.000	0.050
Surrounding companies (E3)	0.043	0.400	0.240	0.000	0.067
Rijkswaterstaat (E4)	0.057	0.424	0.279	0.000	0.075
Water board (E6)	0.057	0.424	0.279	0.000	0.075
Future users (E7)	0.086	0.467	0.345	0.000	0.083

Preliminary design

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Executive board (C3)	0.533	0.632	0.872	0.455	0.143
Steering committee (C4)	0.150	0.571	0.282	0.152	0.110
Project management internal (C5)	0.250	0.571	0.222	0.462	0.132
Concept team (C6)	0.050	0.375	0.047	0.000	0.066
Internal plan team (C7)	0.050	0.375	0.047	0.000	0.066
Internal experts (C8)	0.050	0.375	0.047	0.000	0.066
Project management external (P1)	0.283	0.632	0.631	0.295	0.121
Concept developer (P2)	0.133	0.480	0.439	0.000	0.099
Architect + advisors (P3)	0.133	0.480	0.439	0.000	0.099
Specialist advisors (P6)	0.133	0.480	0.439	0.000	0.099
Municipality (E1)	0.050	0.400	0.184	0.000	0.077
Surrounding companies (E3)	0.050	0.400	0.184	0.000	0.077
Future users (E7)	0.100	0.480	0.243	0.000	0.088

Final design

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Executive board (C3)	0.575	0.696	0.899	0.639	0.111
Steering committee (C4)	0.113	0.552	0.234	0.144	0.092
Project management internal (C5)	0.188	0.485	0.157	0.354	0.098
Concept team (C6)	0.038	0.333	0.029	0.000	0.033
Internal plan team (C7)	0.038	0.333	0.029	0.000	0.033
Internal experts (C8)	0.038	0.333	0.029	0.000	0.033
Project management external (P1)	0.213	0.593	0.526	0.235	0.105
Concept developer (P2)	0.100	0.485	0.374	0.000	0.078
Architect + advisors (P3)	0.138	0.500	0.441	0.015	0.085
Specialist advisors (P6)	0.100	0.485	0.374	0.000	0.078
Utility company (P9)	0.100	0.432	0.358	0.000	0.059
Municipality (E1)	0.100	0.457	0.227	0.013	0.072
Surrounding companies (E3)	0.038	0.421	0.166	0.000	0.039
Rijkswaterstaat (E4)	0.050	0.432	0.180	0.000	0.046
Fire department (E5)	0.075	0.432	0.208	0.000	0.052
Water board (E6)	0.050	0.432	0.180	0.000	0.046
Future users (E7)	0.075	0.485	0.209	0.000	0.065

Engineering

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Shareholder (C1)	0.030	0.435	0.119	0.000	0.035
Supervisory board (C2)	0.030	0.435	0.119	0.000	0.035
Executive board (C3)	0.620	0.741	0.830	0.680	0.091
Steering committee (C4)	0.090	0.541	0.153	0.111	0.078
Project management internal (C5)	0.150	0.465	0.098	0.287	0.082
Concept team (C6)	0.030	0.323	0.014	0.000	0.030
Internal plan team (C7)	0.030	0.323	0.014	0.000	0.030
Internal experts (C8)	0.030	0.323	0.014	0.000	0.030
Project management external (P1)	0.230	0.606	0.489	0.224	0.087
Concept developer (P2)	0.080	0.488	0.269	0.000	0.061
Architect + advisors (P3)	0.170	0.526	0.451	0.009	0.069
Contractor (P4)	0.160	0.513	0.450	0.000	0.065
Co-contractor (P5)	0.190	0.526	0.489	0.009	0.074
Specialist advisors (P6)	0.080	0.488	0.269	0.000	0.061
Utility company (P9)	0.110	0.455	0.333	0.000	0.056
Municipality (E1)	0.080	0.465	0.151	0.008	0.052
Surrounding companies (E3)	0.030	0.435	0.119	0.000	0.035
Rijkswaterstaat (E4)	0.040	0.444	0.126	0.000	0.039
Fire department (E5)	0.060	0.444	0.141	0.000	0.043
Water board (E6)	0.040	0.444	0.126	0.000	0.039
Future users (E7)	0.060	0.488	0.141	0.000	0.048

Construction

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Executive board (C3)	0.625	0.727	0.799	0.533	0.111
Steering committee (C4)	0.113	0.533	0.153	0.081	0.078
Project management internal (C5)	0.150	0.500	0.105	0.250	0.098
Internal plan team (C7)	0.038	0.340	0.015	0.000	0.033
Internal experts (C8)	0.038	0.340	0.015	0.000	0.033
Project management external (P1)	0.350	0.667	0.534	0.348	0.105
Concept developer (P2)	0.100	0.500	0.274	0.000	0.072
Architect + advisors (P3)	0.213	0.552	0.466	0.015	0.085
Contractor (P4)	0.200	0.533	0.466	0.000	0.078
Co-contractor (P5)	0.238	0.552	0.506	0.015	0.092
Specialist advisors (P6)	0.100	0.500	0.274	0.000	0.072
Supervisor execution (P7)	0.063	0.410	0.131	0.000	0.046
Utility company (P9)	0.138	0.457	0.338	0.000	0.065
Municipality (E1)	0.075	0.444	0.137	0.000	0.052
Surrounding companies (E3)	0.038	0.432	0.117	0.000	0.039
Fire department (E5)	0.075	0.444	0.137	0.000	0.052
Future users (E7)	0.075	0.485	0.140	0.000	0.059

Completion

Node	Degree	Closeness	Eigen vector	Betweenness	Influence level
Executive board (C3)	0.588	0.696	0.781	0.434	0.111
Steering committee (C4)	0.113	0.516	0.149	0.069	0.072
Project management internal (C5)	0.150	0.500	0.103	0.250	0.098
Internal plan team (C7)	0.038	0.340	0.015	0.000	0.039
Internal experts (C8)	0.038	0.340	0.015	0.000	0.039
Project management external (P1)	0.350	0.667	0.527	0.365	0.105
Concept developer (P2)	0.100	0.485	0.267	0.000	0.065
Architect + advisors (P3)	0.213	0.552	0.461	0.016	0.078
Contractor (P4)	0.263	0.552	0.497	0.080	0.092
Co-contractor (P5)	0.238	0.552	0.503	0.016	0.085
Specialist advisors (P6)	0.100	0.485	0.267	0.000	0.065
Supervisor execution (P7)	0.063	0.410	0.128	0.000	0.046
Certifying company fire safety (P8)	0.138	0.400	0.168	0.008	0.052
Utility company (P9)	0.138	0.444	0.330	0.000	0.059
Municipality (E1)	0.113	0.457	0.162	0.014	0.065
Fire department (E5)	0.113	0.457	0.162	0.014	0.065
Future users (E7)	0.075	0.471	0.136	0.000	0.052

Appendix G – Dynamic stakeholder management framework

In this section, a dynamic stakeholder management framework is proposed, outlining key stakeholders at each project stage; see Table 49. If not specified, the focus should be on the stakeholder regardless of the project delivery method. This excludes the program manager, whose focus is limited to programs.

Table 49: Dynamic stakeholder management framework

Stakeholder	Initiative	Preliminary design	Final design	Engineering	Construction	Completion
Client	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
Project management entity	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
Program manager	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	●	● ● ● ● ●	● ● ● ● ●
Architect + advisors (DBB + E&C)		●				
Architect + advisors (E&C)		● ●	● ● ● ● ●	● ● ● ● ●	●	●
Contractor				●	●	●
Contractor (DBB + E&C)				●	●	●
Contractor (E&C)				●	●	●

Legend: ● = Powerful ● = Proximate ● = Influential ● = Interests