

MASTER

Toward sustainability transitions dynamics of negotiation processes aimed at implementing innovations

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Award date:
2020

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Eindhoven, June 2020

Toward sustainability transitions: dynamics of negotiation processes aimed at implementing innovations.

Written in partial fulfillment of the requirements for the degree of
Master of Science in Innovation Management

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Series Master Theses Innovation Management

Title: Toward sustainability transitions: dynamics of negotiation processes aimed at implementing innovations.

Keywords: sustainability transitions, innovation implementation, group decision making, negotiation, change management, trust, uncertainties, time pressure, alignment, systems thinking, process analysis.

Foreword

At the moment of writing this last page of my Master thesis, the discovery of the first patient with the COVID-19 virus in the Netherlands is already more than two months ago and we are living in an ‘intelligent lockdown’ for already seven weeks now. This made the last phase of my study quite unusual. The decisions that had to be made during this period of crisis, reminded me of several aspects from the extensive base of literature I have read in the past eight months. Which was partly due to the multiple changes in research topic in the begin phase. Resilience was the first aspect to come to mind. It refers to the capacity of a system to self-organize and to learn and adapt to change. It encompasses the ability of people, societies, cultures, communities, organizations and companies to cope with uncertainties and complex system dynamics. A period of crisis, such as the COVID-19 pandemic right now, requires high resilience. It requires adaptivity to cope with uncertainty. As our Prime Minister Mark Rutte mentioned during one of his press conferences: *“Fact is, that in a crisis such as this, one should take 100% of the decisions, with 50% of the knowledge”* (translated from press conference with Mark Rutte, March 12, 2020). This uncertainty during crises is also present while innovating, and therefore a link toward my thesis was made quickly. Besides, uncertainty is also important in the field of systems thinking. As the quote from John Sterman on the next page indicates: *“All decisions are based on models, and all models are wrong”*. There are always limitations to our knowledge and the mental models from which we act. Furthermore, several cognitive patterns from literature were recognized to be present during this crisis. Something that seemed so far away during Christmas and New Year’s Eve in the Netherlands, suddenly got vivid in the past months to everybody.

These and other linkages between literature and ‘real-life’, made me excited about what I have learned during this final phase of my study. I would like to thank all of the people that made this possible. First of all, Sonja Rispens, my first supervisor. I want to thank you for your patience during my search for the right topic. As we both know, the topics that came by were not all a good match and I was quite stubborn in what I wanted to do. Eventually, I am very happy that the thesis does actually comprise multiple aspects of our both interests. Besides, you shared interesting literature with me and made me reevaluate assumptions, which made me learn. Additionally, I want to thank Bob Walrave for his advice and lessons on system dynamics, and the interesting causal loop diagrams from other research that you shared with me. These made me improve my understanding of application of those models in research.

Next to the advice I received from my university supervisors, I would not have been able to complete this thesis project without the help of Ingrid Bolier, my supervisor from Witteveen+Bos. Your great enthusiasm is inspiring. I very much enjoyed our brainstorm sessions and sometimes almost philosophical conversations about all the topics that came by during my literature search. It broadened my perspective. Furthermore, I am glad that I was able to get to meet the field of Value Management, which has sparked my interest for the future. Thank you for all the time that you have spent in supervising me, and your great flexibility until the end. I also want to thank Floortje Cieraad for her feedback on my writings during the last weeks, and the rest of the Value Management group at Witteveen+Bos for their tips and for the pleasant working atmosphere.

Finally, I want to thank my family and friends for their support and advice, and for giving me the opportunity to relax, to put things in perspective, and to enjoy my time off work.

“All decisions are based on models, and all models are wrong.”

– John Sterman, Jay W. Forrester Professor of Management at MIT

Executive summary

The objective of this study was to explore the dynamics that may underlie the internal process of implementing an innovation which contributes to the sustainability transition. Internal in this regard refers to the organizational aspects of the implementation, such as negotiating collaboration in order to cope with the multi-dimensionality of sustainability transitions. Contrary to what in this study is defined 'external' (e.g., the adoption rate of the innovation, the alignment among system levels or institutional barriers), literature on the internal aspects is limited. This led to the following research question: "*What dynamics underlie the negotiation process of implementing innovations in the context of sustainability transitions?*". This question was addressed by means of an in-depth case study of the implementation process of a Smart Thermal Grid for heating and cooling into an urban area development project in the Netherlands.

Introduction

In the current era, increased attention is going toward environmental problems such as resource depletion, climate change, and the loss of biodiversity (e.g., Biggs et al, 2015; Folke et al., 2016; Köhler et al., 2019). These problems form the motivation of sustainability transitions research. Such far-reaching, fundamental, and structural changes (Zolfagharian et al., 2019) are widely acknowledged to be necessary to cope with these problems. As those type of changes concern a variety of processes, actors, institutions and technologies, they are multi-dimensional (Zolfagharian et al, 2019). Furthermore, uncertainty is at the foundation of such a transition, as it requires a whole-system change (e.g., Ahlborg et al., 2019; Folke et al., 2016; Geels, 2006; Grin et al., 2010; Köhler et al., 2019). One of the most frequently used frameworks to analyze and describe a transition is the Multi-Level Perspective (MLP; Geels, 2002, 2004, 2006). It is based upon a systems perspective and deviates between three levels within such a system; the socio-technical landscape, -regime, and -niche. When all three levels are aligned, a transition can take place (Rotmans et al., 2001).

An example of such a transition in the Netherlands is that from the socio-technical system that fulfills societal function energy, in which a change from heating based on non-renewable resources toward heating based on fully renewable resources takes place. One type of heating using renewable resources is a Smart Thermal Grid (STG), which is a network through which geothermal heat can be transported and to which different sources of supply, consumption and storage can be connected. However, from practice it appeared to be difficult to implement this type of innovations contributing toward transitions. Specifically, the process of negotiating collaboration in those type of projects appears to be difficult. This study explores the dynamics that underlie such a process in order to increase scientific knowledge and provide devices for practice to improve management during these processes.

Theoretical background

As negotiation is an approach to reach consensus-based group decisions (Kong and Yao, 2019), literature regarding group decision-making processes was used and integrated with change management literature. The latter due to the far-reaching, structural change that a transition comprises (Zolfagharian et al., 2019). From literature the following aspects came forward as key factors influencing the negotiation process for implementing innovation; uncertainties, trust, and time aspects. Uncertainties are argued to decrease the willingness to cooperate (e.g., Budescu, Rapoport, & Suleiman, 1990; Gustafsson, Biel, & Gärling, 1999). Trust is influenced by individual factors such as preferences, cognition and behavior, as well as by organizational factors, such as a vision or expectations (Savolainen, 2010). It is perceived to be the foundation of collaboration (De Dreu et al., 2006) and can

be best defined as: “*a psychological state comprising the intention to accept vulnerability based upon the positive expectations of the intentions or behavior of another*” (Rousseau, Sitkin, Burt, & Camerer, 1998, p. 395). Regarding the time aspect, multiple different factors affect collaboration or decision-making processes. The most interesting in the regard of this study was the alignment in speed of decision making processes, which is part of a broader concept in literature referred to as shared temporal cognitions (STC; Gevers et al., 2004).

Another conclusion from literature was that group decision making follows a process of motivated information processing within the group (De Dreu et al., 2006). Epistemic and social motivation on the individual level, affect the information dissemination and integration phase on group level, subsequently affecting the quality of the group decision or judgment. Literature regarding cognitive patterns was found to explain and complement the individual motivations. Five cognitive patterns were identified by Bazerman (2006), explaining the failure to address climate change. These are positive illusions, egocentrism, overly discounting the future, omission bias and status quo, and vividness. The discussed motivated group decision making process and cognitive patterns were considered when exploring the dynamics underlying the negotiation process of the in-depth case study.

Methodology

The setup of this study was a process research approach combined with systems thinking (Langley, 1999; Sterman, 2000). In total ten interviews are used for the in-depth case study. Data was collected via an extensive analysis of various sorts of project documentation (e.g., meeting minutes, mail contact, notes). Furthermore, during analysis of the interview data and by means of a constructed cause-and-effect table, a causal loop diagram (CLD; Sterman, 2000) was constructed. For validation of this model, an expert validation session with two experts was held, in which they reflected on the internal and external validity of the model.

This study was conducted in collaboration with Witteveen+Bos, an engineering and consultancy company. They work internationally with the headquarters located in Deventer in the Netherlands. This study was executed as part of the group Value Management, belong to the product-market combination urban development and business line built environment. The analyzed case was a project on which Witteveen+Bos is still working, due to which a large amount of data was available to the researcher.

Results

First part of the results section is a case description, which served as important context knowledge base for the exploration of the dynamics, which formed the second part. This second part resulted in a CLD which comprises the systems theory that forms the major finding from this study (summarized in Figure 1). It presents a trap of falling into a self-deconstructive path, due to which the implementation of the innovation contributing toward the sustainability transition of the system failed. The theory that resulted from this study showed that a combination of high uncertainty, low knowledge and experience regarding the STG (as it comprises an innovation) and low alignment in decision making processes causes getting trapped in a self-destructive negotiation path. When trust relationships and levels of knowledge and experience are improved and decision-making processes are aligned, this self-destructive path can be interrupted and transformed into a self-constructive path. The findings serve to explain why organizations aiming at implementing innovation in the context of sustainability transitions, might get trapped, despite their seemingly rational decisions and actions. Awareness of the dynamics underlying the negotiation process among actors to set up a collaboration for this type of projects, improves the opportunities to intervene when a self-deconstructive path arises or to even prevent getting there.

Practical implications

The following practical implications were resulting from the findings from this study.

1. Actively steering upon trust building among involved actors improves the possibility of establishing a collaborative relationship. This can be done by focusing on four attributes of trust;
 - a. Authenticity of interactions, thus, actors say what they mean and mean what they say;
 - b. History of delivering on their promises;
 - c. Actors should be able to take responsibility and actually take it;
 - d. Motivations of actors should be focused on the long-term collective good, rather than on the (short-term) individual good;
 2. Awareness and understanding of differences in temporal cognitions of involved actors should be created and subsequently managers should aim at shared temporal cognitions of the project team. In turn, performance of the team increases;
 3. To cope with uncertainties, open information sharing should be ensured. This prevents from biases in information processing and differences in available information for the different involved actors. Subsequently this would positively affect decision making processes;
- The established CLD (Figure 1) can be used for discussion within the team at various moments in the project. Question such as; what can happen, where are we now, what is happening and what can we do to improve, can be asked during this discussion.

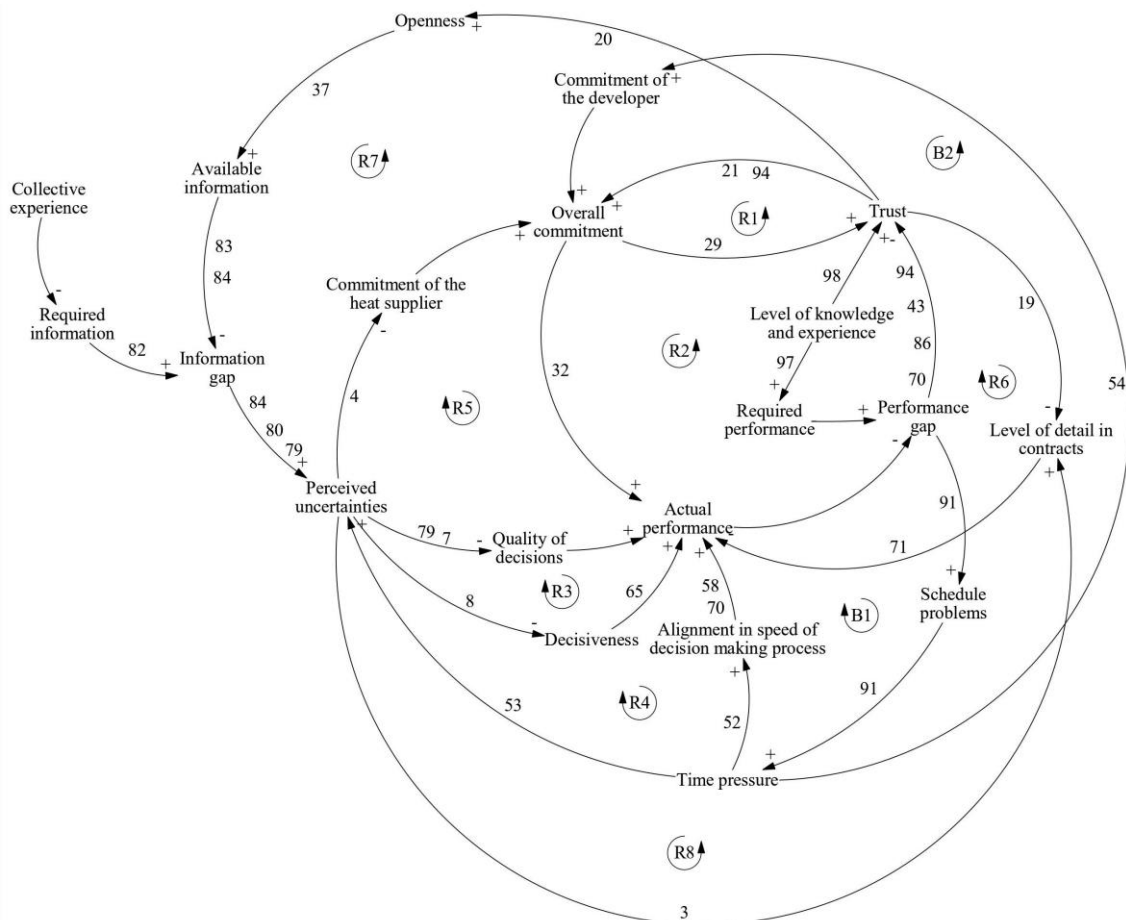


Figure 1: The causal loop diagram showing the trap of a self-destructive negotiation path. Variables are related by causal links, which are shown as numbered arrows. Each causal link is assigned a polarity: either positive ("+") or negative ("-"). A positive link means that if the cause increases (decreases), then also the effect increases (decreases). A negative link means that if the cause increases (decreases), then the effect decreases (increases). The 'B' and 'R' labels denote the nature of the feedback loop: Balancing and Reinforcing respectively. See Sterman (2000).

Table of Contents

1. Introduction	1
2. Case selection and description.....	2
3. Theoretical background.....	4
3.1 Setting the scene: Sustainability transitions	4
3.2 Change management	6
3.2.1 Categories to characterize organizational change	6
3.2.2 Key variables in change management literature.....	8
3.3 Group decision making	11
3.3.1 Introduction and potential weaknesses of group decision making	11
3.3.2 Motivated information processing in groups.....	12
3.3.3 Cognitive patterns.....	14
3.3.4 Negotiation	15
3.3.5 Conclusions	18
3.4 Factors influencing the implementation of innovations	19
3.4.1 Uncertainties.....	19
3.4.2 Trust.....	20
3.4.3 Time aspects	22
3.5 Conclusion.....	25
4. Method.....	26
4.1 Data collection.....	26
4.1.1 Case narrative	26
4.1.2 Exploration of the dynamics.....	27
4.1.3 Construction of the causal loop diagram	27
4.1.4 Validation of the causal loop diagram.....	28
4.2 Data analysis.....	28
4.2.1 Case narrative	28
4.2.2 Exploration of the dynamics and construction of CLD	31
4.2.3 Validation of the causal loop diagram.....	33
5. Results	35
5.1 General case narrative	35
5.1.1 Project documentation: Minutes of meetings	36
5.1.2 Project documentation: Emails, reports and other project team communication	39
5.2 Interviews and Causal Loop Diagram	39
5.2.1 Episode 1	41

5.2.2 Episode 2: The start	44
5.2.3 Data analysis and construction of the CLD	45
5.2.4 Episode 2: Continued	47
5.2.5 Episode 3	58
6. Discussion	60
6.1 Theoretical implications	60
6.2 Limitations and future research	63
6.3 Practical implications	65
7. Conclusion.....	67
References	68
Appendix A: Temporal aspects	74
Appendix D: List of interviewees.....	76
Appendix E: Interview protocol	77
Appendix H: CLD	81

List of figures

Figure 1: The causal loop diagram showing the trap of a self-deconstructive negotiation path.	vii
Figure 2: Organigram of the Expo project (own illustration).....	2
Figure 3: A dynamic multi-level perspective on system innovations (Genus & Coles, 2008; adapted from Geels, 2004). In red the position where the implementation of innovations is of most importance is marked.....	5
Figure 4: Typology of change (Nadler, Shaw and Walton, 1995 in Hayes, 2002: 8)	8
Figure 5: Intensity of change, indicating moments of equilibrium and disequilibrium (Nadler, Shaw and Walton, 1995 in Hayes, 2002: 6).....	8
Figure 6: Four types of relationships among organizations (Hattori & Lapidus, 2004).....	9
Figure 7: A heuristic overview of the motivated information processing in groups (MIP-G) model (De Dreu, Nijstad, & Van Knippenberg, 2008).....	13
Figure 8: Process steps	27
Figure 9: Decision making levels (escalation levels) and their scope	29
Figure 10: Phases in the process (own illustration).....	35
Figure 11: Frequency of discussion of the topics regarding the heating innovation	36
Figure 12: Frequency of topics discussed in director/management, core team and core group level meetings	38
Figure 13: Frequencies of the discussed topics in the meeting minutes per phase.....	38
Figure 14: Frequencies of the discussed topics during the first and second (left) and third (right) phase of the project.....	39
Figure 15: Loop 1.....	41
Figure 16: Consequence 1a, time pressure affecting alignment in speed of decision making processes ('B1').....	50
Figure 17: Consequence 2a, time pressure affecting the quality of decisions ('R3').....	51
Figure 18: Consequence 2b, time pressure affecting commitment ('R5' and 'B2').....	53
Figure 19: Consequence 2c, time pressure affecting decisiveness ('R4').....	54
Figure 20: Consequences 3a, trust affecting the detail of contracts ('R6') and 3b, trust affecting openness and the amount of available information ('R7').....	55
Figure 21: Full model, including consequence 4, perceived uncertainties affecting the level of detail in contracts ('R8').....	58
Figure 22: The 'speed trap' (Perlow, Okhuysen, and Repenning, 2002, p. 946)	76
Figure 24: Involvement of interviewees denoted above the timeline of the process.....	76

List of tables

Table 1: Behavioral decision research (BDR) in two-party negotiation, output from the 1980s and 1990s.	16
Table 2: Code category used in the document analysis.....	29
Table 3: Coding scheme group one, coding category topics of discussion.....	29
Table 4: Coding scheme for the interviews, consisting of the concept name and definition and the categories.....	31
Table 5: Cause and effect relations from the interviews	45
Table 6: Temporal aspects, their definitions and references to research on them.....	74
Table 7: List of interviewees including company name, role and period of involvement	76

1. Introduction

In the current era, increased attention is going toward environmental problems such as resource depletion, climate change, and the loss of biodiversity (e.g., Biggs et al., 2015; Folke et al., 2016; Köhler et al., 2019). These problems form the motivation of sustainability transitions research. Such far-reaching, fundamental, and structural changes (Zolfagharian et al., 2019) are widely acknowledged to be necessary to cope with these problems. An example of such a transition is that from a linear take-make-consume-waste economy towards a circular economy (Campbell-Johnston et al., 2019; Kirchherr et al., 2017), or the transition from heating based on non-renewable resources toward heating based on fully renewable resources in the Netherlands. As those type of changes concern a variety of processes, actors, institutions and technologies, it is perceived to be multi-dimensional (Zolfagharian et al., 2019). Furthermore, uncertainty is at the foundation of such a transition, as it requires a whole-system change (e.g., Ahlborg et al., 2019; Folke et al., 2016; Geels, 2006; Grin et al., 2010; Köhler et al., 2019). A large base of literature exists regarding the analysis of sustainability transitions. One of the most frequently used frameworks to analyze and describe a transition is the Multi-Level Perspective (MLP; Geels, 2002, 2004, 2006). MLP is based upon a systems perspective and deviates between three levels within such a system; the socio-technical landscape, -regime, and -niche. A socio-technical system fulfills societal functions such as mobility, healthcare and energy (Zolfagharian et al., 2019). When all three levels of the system are aligned, a transition can take place (Rotmans et al., 2001).

This alignment of the three levels depends on a great variety of factors and processes. For instance, whether the niche gets adopted by users, whether institutional barriers are present and can be overcome, or whether the current regime prevents a niche from becoming a new regime. However, on a much smaller scale, it also depends on the successful implementation of a certain new niche into the system it belongs to. Taking the example of the heating transition, a niche is geothermal heating. More specifically, a Smart Thermal Grid, which is a network through which geothermal heat can be transported and to which different sources of supply, consumption and storage can be connected. The success of implementing such a niche depends on the mentioned external factors or processes such as adoption, institutional barriers and the influence of the current regime (i.e., natural gas-based heating in the Netherlands). However, from practice it appears that also internal processes influence the implementation success. Those internal processes are more organizational in nature, are not direct consequences of external environment, and comprise the collaboration, specifically the management and decision making, between actors that is necessary in order to cope with the multi-dimensionality of the transition. In order to acquire a ‘full picture’ perspective on system transitions, this internal aspect should be considered in transitions theory as well. In this way, there can be actively directed and steered upon transitions. In current literature, however, less is known about what steers the internal processes. Therefore, this study focuses on exploring the cause-and-effect relations over time that are underlying these processes. The existing literature regarding 1) group decision making, forming the basis of collaboration, and 2) change management, as a transition is a far-reaching structural change (Zolfagharian et al., 2019), is used to gain basic understanding of such collaborative change processes. Integrating these bodies of knowledge into the context of sustainability transitions, is expected to improve understanding of the internal dynamics of such processes and is used as basis for further exploration of those dynamics by means of an in-depth case-study of the implementation process of a Smart Thermal Grid into an urban area development project in the Netherlands. In all, this led to the following research question for this study:

RQ: “What dynamics underlie the negotiation process of implementing innovations in the context of sustainability transitions?”

2. Case selection and description

One of the main characteristics of sustainability transitions are their multi-dimensionality (Markard et al., 2012; Kennedy, Gladek, & Roemers, 2018), making it a complex process in which multiple stakeholders and functions are involved. Therefore, the selected case comprises a multi-actor collaborative project in the field of urban area development. These type of projects usually have to deal with wide variety of functions (e.g., living, working, recreating, etc.) and actors (e.g., stakeholders, users, etc.). Thus, it contains multiple aspects of the multi-dimensionality. Furthermore, in the selected case, it was tried to contribute to the sustainability transitions of the socio-technical energy system, by implementing an innovative heating and cooling grid into the project. For the implementation of this innovation the developing group (i.e. ‘Partnership’, see Figure 2) had to find a collaboration partner for expertise and operation. Therefore, a process of negotiation of the collaboration contract followed. This process of implementing an innovation and the negotiation process that is involved with that, comprises the exact scope of this study aiming at exploration of the dynamics that underlie internal aspects (i.e., negotiation) of implementing innovations in this context. Furthermore, an extensive base of documentation and information regarding the full negotiation and decision-making process was available and made accessible for the researcher to use for this study.

The case that is analyzed, consists of the construction and organization of the Expo, and after the Expo transforming the same area into a new city district, without transformations of large scale. As a result of this, the part of the project concerning urban area development should be executed already prior to the Expo. Besides, the urban area development plan and Expo plan should be aligned in order to retain the infrastructure and buildings used during the Expo in the city district. The project thus has a complex nature and context. Multiple actors, both public and private, are involved, each having varying interests (i.e. social, public and commercial) and organizing logics (i.e. social welfare, market).

The initiative of the project originates at ‘the municipality’ and ‘ExpoCO’, both being public organizations. They set out a tender in order to find companies that were able to develop and realize the project. This resulted in collaboration with project developer ‘DevelopCO’ and later also the project development department of ‘BuildCO’, both private companies. These two companies formed a consortium called ‘Partnership’. One of the sustainable innovations from the project plan was the realization of a Smart Thermal Grid (STG) for heating and cooling of the district. The implementation

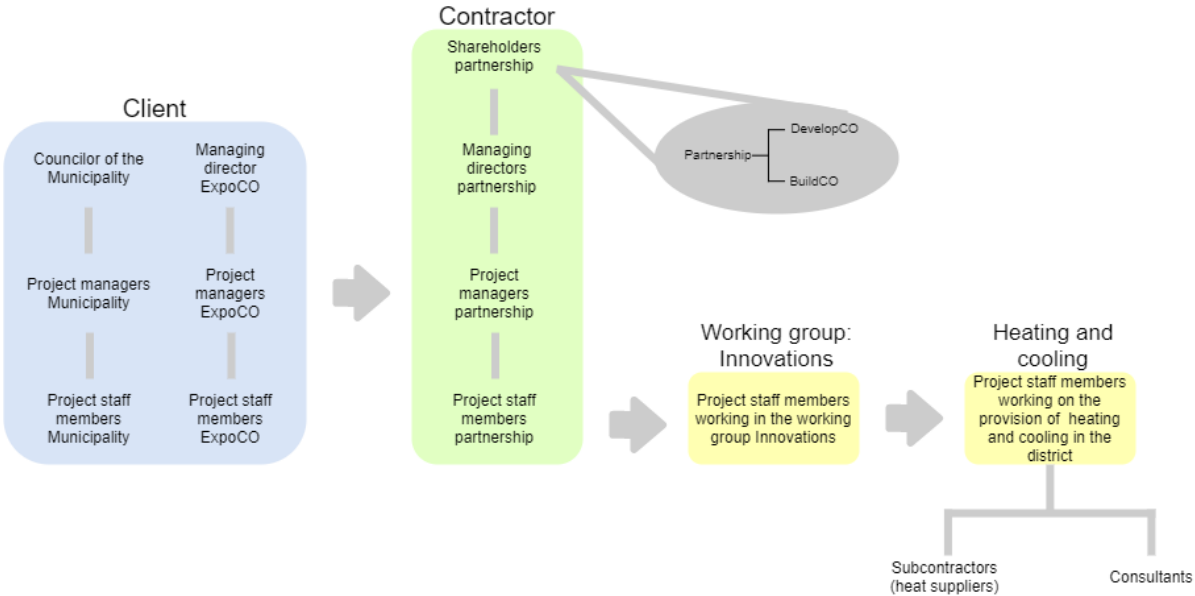


Figure 2: Organigram of the Expo project (own illustration)

process of this innovation into the project will be analyzed in depth. It comprises the collaboration of multiple actors and touches upon all decision-making levels present in the project.

The STG is a network through which renewable energy (e.g., geothermal energy, thermal energy from datacenters and thermal energy from surface water) will be shared with the whole district via a heating grid. The network will also be able to store heat in the soil, when consumption is lower than production. In order to investigate the possibilities regarding realization of the STG, another company was to be contracted by Partnership. This company would be involved to design, build, partly finance, operate and maintain the heating and cooling network in the district. This structure leads to the organization of the Expo project, and specifically the heating and cooling provision, as visualized in Figure 2.

The scope for analysis is the process from selection of a subcontractor to reaching a collaboration agreement. Next to the collaboration with the subcontractor, Partnership contracted consultancy companies, among which is Witteveen+Bos, to advise them during the process.

The process of finding a subcontractor and signing the collaboration agreement took approximately two years, from April 2018 to April 2020. During this process, a lot of negotiation was done in order to reach consensus regarding the collaboration agreement. The mechanisms steering this negotiation process were explored in order to gain better understanding of what affects the success of the negotiation.

3. Theoretical background

In this theoretical background, a group decision-making perspective is taken and applied to the context of implementing innovations contributing toward sustainability transitions. Collaboration is common and a necessity for projects in the field of sustainability transitions due to the multi-dimensionality regarding processes, actors, institutions and technologies of these transitions. Furthermore, the analyzed case comprised a construction project. For the construction sector, collaboration is as well very common and also necessary feature, as a broad range of expertise needs to be combined in order to be able to realize a construction project (e.g., Hosseini et al., 2018; Hughes et al., 2012). This is due to that the projects concern the full process from design to build, finance, operate and maintain, oftentimes represented by multiple separate organizations.

This chapter consists of firstly an introduction to sustainability transitions literature, being the context of this study. Secondly, change management literature is discussed as on the one side, a transition is a far-reaching, fundamental and structural change (Zolfagharian et al., 2019) in itself, implying the usefulness of knowledge on management of changes. On the other hand, due to working on implementing an innovation (i.e., the STG), changes in standard ways of working are likely to be required among all involved actors, as all is new for everybody. These changes within organizations, also affect communication among them and the way in which they make decisions. Therefore, the literature regarding sustainable transitions and change management, should be further complemented by group decision making literature, which is done in the third section. In the fourth section, impact factors discussed in literature on the integrated topics change management and group decision making, are further elaborated. Finally, the fourth section provides a short summary of the knowledge as described in this theoretical background.

3.1 Setting the scene: Sustainability transitions

The large-scale environmental problems that are present in the era we live in, form the underlying motivation for sustainable transition research (Biggs, Schlüter, & Schoon, 2015; Folke et al., 2016). Examples of these problems are resource depletion, climate change, and the loss of biodiversity (Köhler et al., 2019). The required far-reaching, fundamental and structural changes of a system in order to cope with environmental challenges are referred to as sustainable transitions (Zolfagharian, Walrave, Raven, & Romme, 2019). These systems enable particular desirable societal functions such as mobility, energy or healthcare. For example, the change from a linear economy in which products are produced, used and turned into waste (i.e., take-make-consume-waste), towards a circular economy in which there exists no waste and optimally all virgin materials are reused or recycled (Campbell-Johnston et al., 2019; Kirchherr, Reike, & Hekkert, 2017), is a sustainability transition. Key characteristics of a transition are:

- Its multi-dimensionality regarding processes (e.g., political, socio-cultural, technological change), actors, institutions and technologies (Zolfagharian et al., 2019);
- Its uncertainty (e.g., Ahlborg et al., 2019; Folke et al., 2016; Geels, 2006; Grin et al., 2010; Köhler et al., 2019);
- The fundamental nature of the changes (Zolfagharian et al., 2019).

These aspects make the decision-making in these types of issues is extremely complex (Pruyt, 2006).

Since a fundamental system change is going on in transitions, transformability is the capacity in a social–ecological system to create a fundamentally new system configuration. One of the most frequently used theories to describe and analyze transitions is the Multi-Level Perspective (MLP; Geels, 2002, 2004, 2006). It states that a transition takes place on three levels in which society can be divided: The Socio-

Technical Landscape (i.e., macro level, comprising external factors influencing the stability of the current system and opportunities of the niches), the Socio-Technical Regime (i.e., meso level, comprising the common way of doing things or the stable, generally adopted approach within the system) and the Socio-Technical Niche (i.e., micro level, comprising other ways of doing things in the system, which are not generally adopted (yet) and might after transition become the new regime). As example take the socio-technical system of energy and heating in the Netherlands, in which the current regime is natural gas-based heating. An example of an element from the landscape are sustainability goals set by the Dutch government. Niches are for instance geothermal or electrical heating. All three levels should be aligned in order to transform and thus, in order for a transition to take place (Rotmans, Kemp, & Van Asselt, 2001). Genus and Coles (2008) adjusted the MLP from Geels (2004) towards a dynamic variant as visualized in Figure 3. They included a timescale, which allowed for indicating the process of niches becoming the new regime in red.

A transition consists of a sequence of short-term innovations (Geels, 2002b). By successful implementation of innovations, niches can start to become the new, more sustainable, regime. However, in order to succeed as regime, these niches should be aligned towards the other levels of the system. Analysis of how aligned innovations are to the system, is determined in earlier phases of the innovation funnel. This funnel exists of research and development phases (sometimes further split up), in which ideas are generated and tested and the aim is to eventually develop an innovation (Adner, 2006). However, literature concerning the phase after successful development of an innovation (i.e., the implementation phase) is lacking, whilst it is an important phase in the process of a niche becoming (part of) a new regime (i.e., the red demarcation in Figure 3). Thus, successful implementation of innovations is extremely important in realizing a sustainable transition. However, steering sustainability transitions is difficult due to the uncertainty of knowledge about the dynamics of the system (Meijer and Hekkert, 2007).

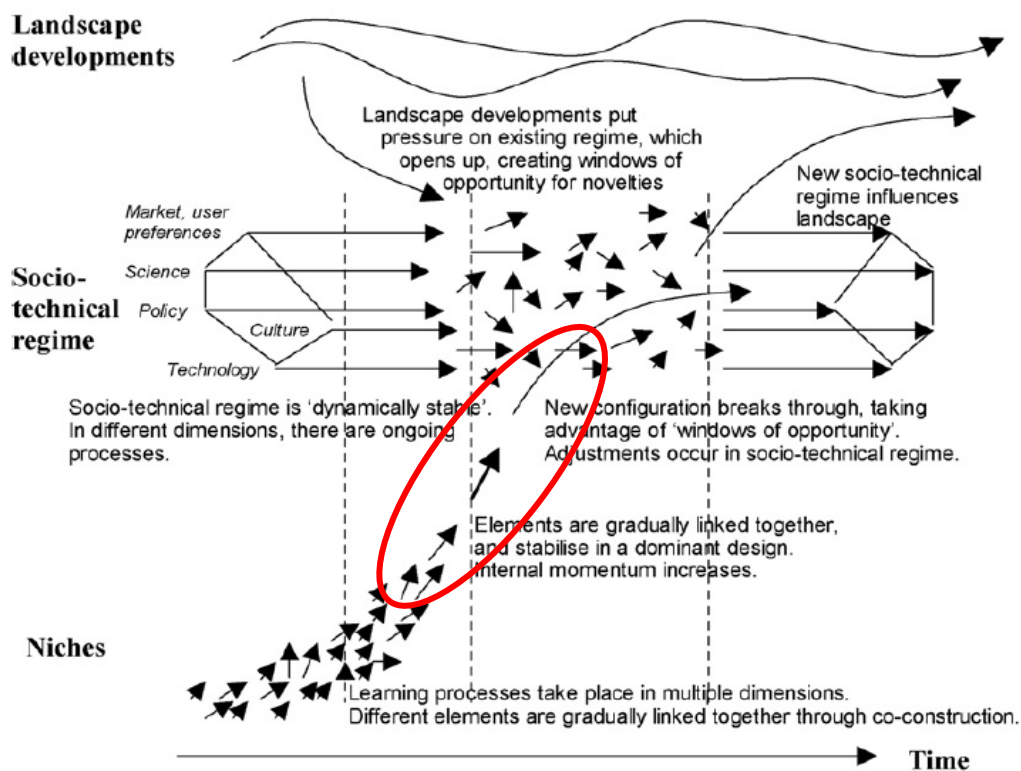


Figure 3: A dynamic multi-level perspective on system innovations (Genus & Coles, 2008; adapted from Geels, 2004). In red the position where the implementation of innovations is of most importance is marked.

One body of knowledge regarding implementation of innovations is Strategic Niche Management (SNM). In SNM it is tried to overcome the ‘Valley of Death’ (i.e., the steps between development of a niche and its market introduction, where often failure occurs) by the creation of ‘safe spaces’ (Kemp, Schot and Hoogma, 1998; Schot and Geels, 2008). The innovation can develop and mature in these safe spaces, before it has to deal with market forces. Barriers causing the ‘Valley of Death’ are for instance technological, governmental/political or cultural/ psychological in nature (Kemp et al., 1998; Mourik & Raven, 2006). The SNM theory assumes that this competition with well-established technologies is the reason for failure of implementing radical innovations. This idea is linked towards the MLP, as the well-established technologies represent the current socio-technical regime of the system. This regime will intuitively work against the innovation, as it tries to take over its place in the system. Tools from SNM are 1) management and shaping of expectations at the start of a project, as positive associations contribute to acceptance, 2) the establishment of networks and common understanding within these networks to reach the shared goals, and 3) learning during the implementation process.

In the following sections, further elaboration follows on the expected benefits of the combination of group decision making literature and change management literature in the context of sustainability transitions. Success, in this context, concerns improvements of sustainability by providing ways to cope with environmental problems such as natural resource depletion. In order to achieve this, movement and eventually changes in current regimes are required; transitions. The successful implementation of innovations in large-scaled, collaborative projects facilitates sustainability transitions, as these innovations (i.e., niches) can become or be part of a more sustainable regime.

As difficulties in the implementation of innovations still exist, the SNM tools are not sufficient to assure successful implementation. Moreover, the SNM tools are mainly focused on external processes, namely, the suitability of the niche in the external environment (i.e., whether it fits and ‘works’ within the system). More understanding of the mechanisms steering what is in this study referred to as ‘internal processes’ during the implementation phase would complement existing knowledge. Furthermore, it allows acquirement of a ‘full picture’ perspective on system transitions and the ability to actively direct and steer the processes accompanied with these transitions. These internal processes comprise two aspects; 1) collaboration, as various actors are involved, and 2) the ability to cope with something ‘new’. Those two aspects direct toward group decision making literature and change management literature respectively, which are more thoroughly discussed in the next sections (2.2 and 2.3).

3.2 Change management

In this section, a review is provided concerning change management literature. It consists of a discussion of the characterization of organizational change and the key variables affecting successful change according to literature. The objective of this section is to generate understanding about what supports or promotes the management of change and what challenges it. The results from this review can be considered while analyzing the internal processes present in the given context of innovation implementation in the field of sustainability transitions.

3.2.1 Categories to characterize organizational change

Change management is defined as “*the process of continually renewing an organization’s direction, structure, and capabilities to serve the ever-changing needs of external and internal customers*” (Moran and Brightman, 2001: 111). It is characterized by unpredictable events, due to which it tends to be reactive, discontinuous, ad hoc and often triggered by a crisis within the organization (Burnes, 2004; De Wit and Meyer, 2005; Luecke, 2003; Nelson, 2003). Luecke (2003) furthermore indicates the necessity

of successful change management in order to survive and succeed in the competitive and rapidly changing environment of today. Senior (2002) identifies three categories to characterize change, briefly discussed in the following paragraphs; 1) its scale, 2) how it comes about and 3) the rate of occurrence.

The first category to characterize change is its scale. Four types exist within this category; fine-tuning, incremental adjustment, modular transformation, and corporate transformation (By, 2005; Senior, 2002). Senior (2002) explains the differences of those four types. The first, fine-tuning, refers to an ongoing process to match organization's strategy, processes, people and structure. The second, incremental adjustment, refers to the type of change in which strategies and management processes are modified in an incremental way. More radical changes in departments or divisions are belonging to the third type, modular transformations. When the radical changes comprise the whole organization, it is described as corporate transformation.

Second category, how it comes about, describes where a process of change originates from. By (2005) identified four types; planned, emergent, contingency and choice. The planned change type is best described by its steps of unfreezing the present level, moving to the new level and refreezing this new level (Lewin, 1946 as in Burnes, 2004). This process shows the importance of discarding old behavior in order to adopt new behavior. Furthermore, it is top-down driven. The emergent change type is, contrary to the planned change type, bottom-up driven. This type states that identification, planning and implementation of organizational responses to the change is impossible, due to the unpredictable and rapid nature of change. Change is perceived as open-ended continuous process of adaptation to the changing context (Burnes, 2004; By, 2005), and of learning (By, 2005). The contingency type of change focuses on the situational variables affecting the performance of an organization. Contrary to the emergent approach to change, which is argue to be suitable for all organizations, all situations and at all times (Burnes, 1996, as in By, 2005), the contingency change theorists argue the necessity of a situational approach in order to successfully manage change. In other words, contingency suggest a 'one best way for each', instead of a 'one best way for all' approach. Last type is change due to choice, where organizations that want to maintain or promote a certain managerial style, can affect the change process toward it (Burnes, 1996, as in By, 2005).

In the third category, the rate of occurrence, multiple different terminologies are employed for what in the basis are argued to be five different types; 1) discontinuous, 2) incremental, 3) bumpy incremental, 4) continuous, and 5) bumpy continuous change (for a review, see By, 2005 and Hayes, 2002). A brief description is provided below.

1. Discontinuous changes refer to rapid changes in strategy, structure or culture of an organization, or all three. It happens during a stage of disequilibrium (Hayes, 2002), which is indicated in Figure 5 as the period high variation in intensity, marked in red. Oftentimes discontinuous change is also referred to as transformational change (e.g., Kotter, 1999; Burke and Litwin, 1993).
2. During incremental changes, individual parts of an organization deal increasingly and separately with one problem and one objective at a time (Burnes, 2004). Focus is on 'doing things better' and these type of changes occur during a period of equilibrium (Hayes, 2002; the period of low variation in intensity, marked in green in Figure 5). Changes are operational in nature.
3. When bumpy incremental change occurs, periods with a slow pace of change are punctuated by periods of accelerated pace of change.
4. Continuous change comprises organization-wide strategic changes and the ability to constantly adapt, corresponding to the demands from external and internal environment.

- The last type, bumpy continuous changes, are characterized by changes in pace, similar as the bumpy incremental type is, during various periods of the continuous change.

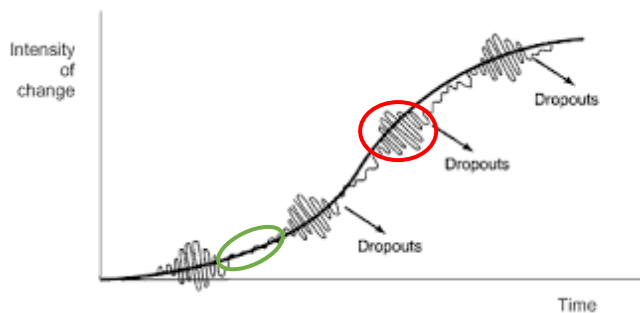


Figure 5: Intensity of change, indicating moments of equilibrium and disequilibrium (Nadler, Shaw and Walton, 1995 in Hayes, 2002: 6)

	Incremental	Discontinuous
Anticipatory	Tuning	Re-orientation
Reactive	Adaptation	Re-creation

Figure 4: Typology of change (Nadler, Shaw and Walton, 1995 in Hayes, 2002: 8)

Nadler and Tushman (1995) differentiated only between an incremental or discontinuous rate of occurrence. However, they used another category to characterize change, namely, the type of response. This can be reactive or anticipatory. Combining these two axes; incremental vs. discontinuous and reactive vs. anticipatory, led to the typology shown in Figure 4. Tuning refers to a not immediately required change, but a process where one seeks to improve the strategic vision with minor adjustments. Adaptation, the reactive and incremental change type, involves responding to a pressing external demand for change. Re-orientation and re-creation involve transformations. The former fundamentally redefines the organization, initiated in anticipation of the future. The latter is reactive and involves high speed and simultaneous transformation of all basic elements of an organization. In the next section, variables influencing the change process are discussed.

3.2.2 Key variables in change management literature

Kotter and Schlesinger (1979) argue that successful change strategies are internally consistent and fit the most important situational variables. Hayes (2002) sums up six key situational variables influencing the success of a change:

1. The urgency and stakes involved;
2. The clarity of desired future state;
3. The amount and type of resistance that is anticipated;
4. The availability of required data to the change managers;
5. The degree to which other stakeholders trust change managers;
6. The degree to which change managers have to rely on commitment and energy of others to implement the plan.

Findings from literature regarding the aspects trust, commitment and urgency are further elaborated in the following paragraphs, according to the expectation that these aspects are most important within the context of this study. Regarding the other concepts, for instance the amount and type of resistance, the presence and thus effect is expected to be low, as all involved organizations in the case are consciously choosing to participate. The second and fourth variables regard the uncertainty (i.e. about the future state and as a result of available data), which will be elaborated in section 2.4.

Neves and Caetano (2007) state that risks are inherent to organizational change, and that in order to understand how employees perceive change and to what level they stay committed to the organization, depends strongly on trust. Higher trust in the supervisor is showed to increase organizational

commitment, when perceived control over the change is low. Furthermore, the level of trust that employees have in their supervisors fully mediated the relation between interpersonal justice, affective organizational commitment and perceived supervisor support.

Lines et al. (2005) indicate that a period of organizational change represents a critical moment for the trust employees have in their management. The authors showed that both the post change emotional stress and the use of referential accounts for justifying change are both negatively related to post change trust in management. Positive relation was found between post change trust in management and the three aspects decision quality, the use of ideological accounts and participation. Finally, tenure (i.e., expressed as work experience) is showed to moderate the effects of change on trust. Sørensen, Hasle and Pejtersen (2011) state that trust is essential for the success of change, but simultaneously, transformational change challenges trust. Via a case-study, they found that uncertainty plays a major role in the development of the concept trust during a change implementation. This uncertainty causes the desire to test the intentions of the management and to interpret intentions of the management in an exaggerated manner. Subsequently, this leads to a decrease of trust. Response of the management is then similar with negative interpretations, which causes a negative spiral. Proposed fix are strong actions of the management, symbolizing integrity, competence and willingness.

The study of innovation implementation regards the “*process by which employees become capable and committed to using a particular innovation*” (Michaelis, Stegmaier, & Sonntag, 2009: 399). Commitment to the change is identified as important aspect of behavioral intention to support change (Herscovitch and Mayer, 2002; Fedor et al., 2006; Michaelis et al., 2009). Klein and Knight (2005) indicate two factors that are influencing innovation implementation behavior, 1) the climate for innovation implementation that the team or organization has, and 2) managerial patience.

Hattori and Lapidus (2004) constructed a matrix consisting of four types of relationships among organizations and the corresponding required state of trust, motivating forces, outlook, behavior and potential outcomes. It consists of collaborative, cooperative, competitive and adversarial relationships types. It is showed in Figure 6.

Relationship type	State of trust	Motivating force	Outlook	Behavior	Potential outcomes
Collaborative	Highly invested	For the good of the whole	Synergy	Responsible	Breakthrough innovation
Cooperative	Transaction oriented	For successful project outcomes	Win-Win	Willing	Preconceived success
Competitive	Reluctant or cautious	To look good	Win within rules	Shrewd	Compromise
Adversarial	Distrust	Not to lose	Win at any cost	Cut-throat	Unpredictable

Figure 6: Four types of relationships among organizations (Hattori & Lapidus, 2004)

Next to the importance of trust for successful change, urgency is an important aspect. Haynes (2002) states that management of change is more difficult when exposed to a high urgency level. This is caused by three aspects. First reason is that generating motivation and commitment to the change and reduce resistance takes time, as it involves encouraging participation and involvement of people. When the

need for change is urgent, there might be not enough time to do this properly. Secondly, there is also less time for experimentation with creative solutions, and third, less time is available to plan and manage change.

All of these factors concern changes within an organization, which is a different scope as that of sustainability transitions. However, collaborative practices contributing to sustainability transitions comprise system changes, which subsequently require change within each of the involved organizations as well. For instance, standard processes and approaches to projects have to be adjusted toward the new situation that is accompanied with the innovation. These internal changes are expected to also affect the process of reaching a collaboration. Therefore, in order to explore the mechanisms steering internal processes during the implementation of innovations, the effects of the changes within all the involved organizations on the process should be considered as well. Furthermore, it will be tested whether the key variables for successful change management within organizations are also present (and key) in the interorganizational negotiation process contributing toward a system change (i.e. transition).

From change management literature some expectations can be constructed regarding the internal processes while implementing an innovation contributing to a sustainability transition, as change management concerns specifically an internal focus. Testing whether or not these expectations hold for the interorganizational context as well as for the intraorganizational context, extends the functionality of change management literature. Before continuing, the characteristics of sustainability transitions and projects within this transition should be recalled. These are multi-dimensionality, uncertainty and the long-term, far-reaching, structural nature of the changes. These aspects make management and decision making in this type of issues is extremely complex. While projecting this complexity on the six key factors from change management literature, key factors one, four and five are expected to be present and strongly affecting the success of the implementation process of the innovation. These are respectively the urgency and stakes involved, the availability of required data to the change managers, and the degree to which other stakeholders trust change managers. The second key factor (i.e., the clarity of the desired future state) is likely to not be fulfilled as a consequence of the presence of uncertainty. The third key factor (i.e., amount and type of resistance that is anticipated) is expected to be not as present in the context, as the focus is on internal processes of collaboration, from which it is expected that all involved actors are committed to the goal of implementing the innovation, leading to low resistance. The sixth key factor (i.e., the degree to which change managers have to rely on commitment and energy of others), is expected to be high as sustainability transitions are multi-dimensional and thus often include technological, material, organizational, institutional, political, economic and socio-cultural aspects of change.

Insight 1; The following four aspects are expected to be key factors for the successful implementation of innovations in the context of sustainability transitions;

- a. The urgency and stakes involved in the change process;**
- b. The availability of required data to the involved actors;**
- c. The degree to which stakeholders trust each other;**
- d. The level of reliability on commitment and energy of others.**

Second aspect of the internal focus on the implementation of innovations in the provided scope of this study is group decision making, which is discussed in the next section.

3.3 Group decision making

Group decision making is at the basis of collaboration and the outcome of it. In order to implement innovations contributing toward sustainability transitions, collaboration between actors that have different expertise is required. By combining their knowledge, the multi-dimensionality of systems changes (i.e., transitions) can be coped with. Furthermore, as this study attains a systems perspective and the base of systems thinking is the perception that all elements in the system are interrelated, it never comprises a single organization and collaboration is always present. When multiple actors collaborate, decisions have to be made together instead of alone, leading to other approaches of coming to a decision than when someone decides alone. Besides, it affects the quality of the outcome of decisions in various ways. This section discusses several aspects of group decision making. At first, an introduction and potential weaknesses of group decision making. Second, the perspective of groups as information processors is discussed, to increase understanding regarding the process of group decisions making. Discussed third are cognitive patterns, as these influence the decision-making process at the individual level. Finally, and fourth, the process of negotiation in consensus-based group decision making is considered. Reason is that often a consensus decision rule is applied in collaborative setting and in projects in the context of sustainability transitions, and for consensus discussion of the alternatives is required in order to decide. This discussion consists of a process of negotiation, leading to the broad base of literature on this subject.

3.3.1 Introduction and potential weaknesses of group decision making

Many decisions are made in groups. For instance, political action or business strategies for companies are usually made by groups of politicians and advisors and groups of top management respectively. Decisions during the process of implementing innovations are often made in groups as well, as multiple actors are collaborating in order to integrate an innovation into practice. The type of decision rule applied in these situations is that of consensus; where everybody ‘can live with it’ after discussion. Other decision rules are majority rule, where the preference of the majority ‘wins’; the voting rule, where the preference with the most votes ‘wins’; and unilateral decision making, where one person is decision maker, however, he or she can be advised by others but eventually decides alone.

Making decisions in groups has several positive effects. For instance, in a group certain level of understanding may be reached which members alone could not have reached (e.g., Fraidin, 2004; Laughlin, Hatch, Silver, & Boh, 2006). Or, as a result of increased creativity of group work compared to individual work, innovations can be developed within organizations, which positively affect the profitability and continuity of the organization (e.g., Hambrick & Mason, 1984; West & Anderson, 1996). On the contrary, groups making decisions can also result in negatively perceived outcomes by the group members themselves or some normative standard. For example, as well as positive effects on creativity, group decision making can also affect it negatively (Diehl & Stroebe, 1987). Besides, effects such as 1) groupthink, 2) a ‘risky shift’, 3) shared information bias, or 4) conformity seeking behavior can occur. These effects are further explained in the following paragraphs.

Groupthink is defined as “A deterioration of mental efficiency, reality testing and moral judgment that results from in-group pressures” (Janis, 1982). More focus is on preservation of unanimity and agreement within the group, than there is on critical reflection on the facts. It often occurs in groups with high cohesion (i.e., with no conflicting opinions), and where there is strong directive leadership. Oftentimes, a formal decision-making process is lacking.

One speaks of a 'risky shift' (i.e., polarization) when group decisions are more extreme than average individual decisions of the group members before discussion. Theory behind this process is that of persuasive arguments, where hearing arguments of one or more other group members moves individuals from their own opinion towards that of the others. Furthermore, social comparison theory suggests that comparing one's own opinion to that of the most favored person in the groups makes an individual changing his/her opinion (i.e., 'majority rules'). Movement of the decision towards the opposite direction is also possible; the 'cautious shift'. Other aspect influencing this process is that of diffuse responsibilities, where responsibility is shared among the whole group instead of an individual, decreasing the perceived risks of individuals. In other words, groups are risk-neutral, whilst individuals are risk-averse.

Stasser and Titus (1985) outline the shared information bias. Groups can possess more information than individuals and thus base their decisions on a more complete 'picture'. However, sharing information is required for this, which is not always happening as shown by the experiment of Stasser and Titus (1985). In this experiment, decision makers were provided with unique information and the group as a whole was provided with certain information. When the unique information was shared, the quality of the decision increased, if not, it decreased. The mechanism steering this process is the common knowledge effect, in which shared information has a greater impact on the decision than unique information. This is a consequence of the lacking validation possibilities of unique information, and simply the unwillingness to share unique information.

The fourth negative effect group decision making can have, is conformity seeking behavior. When people feel certain pressure by the group (i.e., peer pressure) and abandon their own intentions (i.e., seek conformity), this affects the outcomes of the decision-making process. Experiments done by Asch (1951, 1955, 1956), show this conformity effect in groups.

Tools to solve these negative effects are the 'devil's advocate', where one takes the opposite stance to prevent from conflict avoidant behavior while evaluating alternatives. Secondly, there is the Delphi method, where people first write down anonymously what their stance is. Third is the nominal group technique in which all group members write down ideas silently and present them, without discussion. After presentation of all ideas, voting about order takes place. Fourth tool is brainstorming in which creativity is promoted by the lack of critical discussion (i.e., 'everything is possible').

3.3.2 Motivated information processing in groups

De Dreu, Nijstad and Van Knippenberg (2008) constructed a 'motivated information processing in groups' (MIP-G) model, which is based upon the perception of groups as information processors in order to perform cognitive tasks (Bazerman, Mannix & Thompson, 1988; Hinsz et al., 1997; Laughlin & Ellis, 1986; Laughlin, VanderStoep, & Hollingshead, 1991; Von Cranach, Ochsenein, & Valach, 1986). As an illustration of this information processing, Nijstad and Paulus (2003) show that individuals within groups possess certain resources, such as knowledge or skills, which are used to develop for instance preferences, ideas, and solutions. In a similar way, this holds for groups, as the combined contributions of individuals produce a coherent, feasible, sensible and creative group judgment or decision. This process in which group members combine these resources and preferences and produce a decision, exemplifies group-level information processing (De Dreu et al., 2008). The MIP-G model contributes to the understanding of group decision making processes and the influence on these processes coming from the social and epistemic motivation of individuals.

Two underlying conceptions are the existence of multiple motives within group tasks, and the engagement of individuals in more or less deliberate search for information and processing thereof. A distinction is made between social motivation (i.e., concern of self-interests vs. collective welfare and joint success) and epistemic motivation (i.e., willingness to extent effort to achieve a thorough, rich and accurate understanding of the group situation) as factors within the MIP-G model. As shown in Figure 7, an individual’s social motivation is argued to influence the bias in information processing. His or her epistemic motivation influences the search and production of new information and the processing depth thereof. Then, at the group level, the resulting information from the individual level will be disseminated, exchanged and integrated. Thus, the information at group level is automatically biased due to the individual level prior to the group’s information processing. Furthermore, social and epistemic motivation also directly influence group information processing (e.g. due to information withholding, or ‘spinning’ of information). Whether and how information dissemination, exchange and integration of the group influences the quality of judgment and decisions, is argued to depend heavily on two other factors. Namely, the importance of group member input and the urgency of the decision to be made. The first concerns the indispensability of member input for nonroutine tasks. The latter concerns the suitability of extensive information processing, as a consequence of high epistemic motivation, in the case of a high urgent decisions, which might not be the most suitable approach. Thus, urgency affects what level of detail in information processing is appropriate. Further analysis of urgency in decision making processes follows in the third section of this chapter. Eventually, these factors influence the quality of the group decision. To illustrate, when certain information is withheld from the group, it is not considered for the decision, due to which the decision is based upon incomplete knowledge, causing the quality to decrease.

Psychological processes behind the effects of social motivation are social dilemmas (Van Lange, Joireman, Parks, & Van Dijk, 2013), also referred to as mixed-motive games or conflicts (Komorita & Parks, 1995; Lind, 2001). A well-known example of a basic social dilemma is the prisoner’s dilemma, in which all decision makers have a dominant strategy dictating non-cooperation. When all decision makers choose this strategy, all end up worse than when they had cooperated. Van Lange et al. (2013)

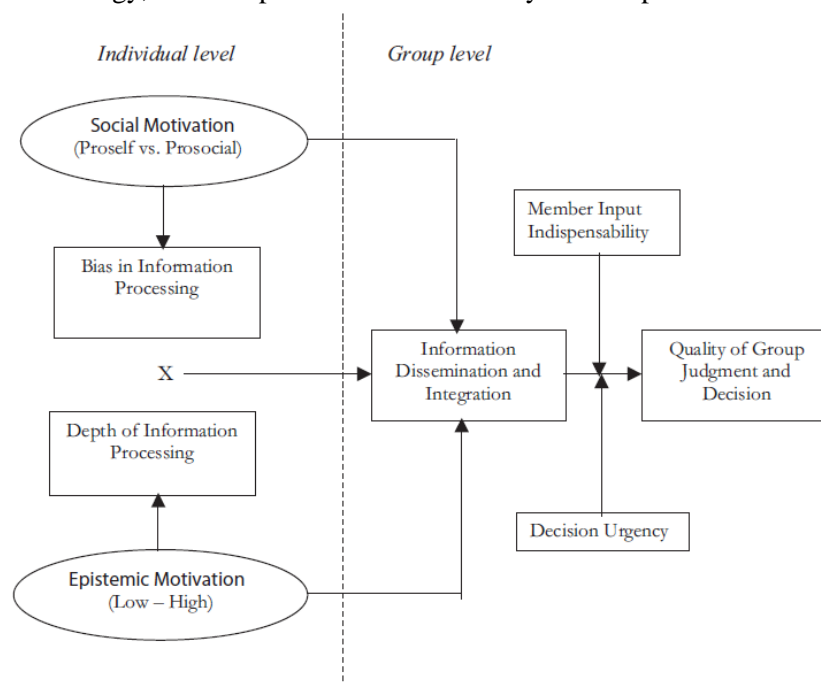


Figure 7: A heuristic overview of the motivated information processing in groups (MIP-G) model (De Dreu, Nijstad, & Van Knippenberg, 2008).

add a temporal dimension to the definition. It proposes the choice between immediate self-interest and longer-term collective interests. This more inclusive conceptualization allows for incorporation of social traps, social fences, public good dilemmas and resource dilemmas, of which examples are the chicken dilemma and the assurance dilemma (Van Lange et al., 2013). Oftentimes, in real life situations, there is a level of uncertainty present in such dilemmas, which is reducing the willingness to cooperate (e.g., Budescu, Rapoport, & Suleiman, 1990; Gustafsson, Biel, & Gärling, 1999). Another variable closely linked to cooperation is trust. These influence factors are more thoroughly discussed in section 2.4.

3.3.3 Cognitive patterns

The second mechanism underlying (group) decision making processes are cognitive patterns. Cognition refers to individual mental processes (Merriam-Webster dictionary, 2019). Bazerman (2006) provides five cognitive explanations for the failure to address climate change. Climate change is an example of what Bazerman refers to as an ‘predictable surprise’; which is defined as “*an event that leads an organization or nation to react with surprise, despite the fact that the information necessary to anticipate the event and its consequences was available*” (Bazerman, 2006, p.179). The cognitive explanations are argued to answer the commonly asked question in society when a predictable surprise ‘occurs’; “Why don’t leaders act to prevent the crisis?”. Most of the time, a singular answer is given to this question, which, according to Bazerman (2006), will allow the social problem to grow because focus on one cause will leave the other causes unattended. The five cognitive explanations as identified by Bazerman (2006, p. 182) are listed below:

1. Positive illusions;
2. Egocentrism;
3. Overly discounting the future;
4. Omission bias and status quo;
5. Vividness.

The first, positive illusions, refers to when one has a more positive view than what is objective. It can have positive (e.g. enhancing self-esteem; Taylor, 1989), and negative effects (e.g. reduced quality of decision making; Dunning et al., 2005). They are present everywhere in everyday life. For example, the expectations students have regarding getting a good job and salary and giving birth to a gifted child are far more likely than what reality suggest (Taylor, 1989). Furthermore, the controllability of future is often falsely believed in, as explained by Bazerman et al. (2001).

The second cognitive explanation, egocentric or self-serving interpretation of events, is visible in the blaming others of being the main cause of climate change. It describes the process of less critical judgments regarding oneself (i.e., self-serving) compared to others, and the degree of credit and blame one takes on. Resulting is a conflicting assessment of the available decision or solution alternatives (Bazerman, 2006).

The deduction of the importance of the future over time, even though we claim to care, forms the third cognitive pattern. Would you prefer to receive \$20,000 today or \$24,000 in a year? A majority would choose the \$20,000 today (Bazerman, 2006). This process of discounting the future is supported broadly in literature, for example by Grijalva, Lusk and Shaw (2014). They found an average discount rate of 4.9% when using a time horizon of 20 years, which is opposing studies that used a shorter time horizon and found higher discount rates as a result. This can be explained by the (non-constant) degradation of the discount rate over a longer time horizon (i.e., 0.5% in 100 years). Furthermore, they found that risk

perception and discount rates are related; a pessimistic view of future technological progress results in a lower discount rate and vice versa.

Fourth cognitive pattern is the desire to maintain the ‘status quo’ and refusal to accept any harm (even when it would bring about a ‘greater good’). This leads to the greater probability of making “*errors of omission*” (inaction) than “*errors of commission*” (causing harm) (Ritov and Baron, 1990, as discussed by Bazerman, 2006, p.186). This can be exemplified by the ‘opt-in’ vs. ‘opt-out’ donation programs. In countries where donation of organs happens automatically after death unless they opt out, much more lives are saved (i.e. donation rate from 86 to 100 percent), than in countries where one has to opt in before donating organs after their passing (i.e., donation rate from 4 to 28 percent; Johnson & Goldstein, 2003). The second part of this pattern is the tendency to remain the status quo (i.e., current situation as it is). The mechanism causing this is the greater attention to losses than to gains (Kahneman & Tversky, 1982, as discussed by Bazerman, 2006). According to Bazerman et al. (2001), governments are most affected by this desire to maintain status quo.

Vividness is the fifth cognitive explanation, describing the lack of personally experiencing the problem or witnessing it through vivid data, decreasing the tendency to invest in it (Bazerman, 2006). The mechanism behind this is the ‘availability’ heuristic, which means that when people have to estimate the frequency of an event to happen, they will indicate a higher frequency when they can more easily recall an event (Tversky & Kahneman, 1974, as discussed by Bazerman, 2006). Thus, if an event is better remembered, it is perceived to happen more often. One of the implications of this vividness pattern is that events affecting the present or near future are more vivid (i.e. clear, powerful) than events happening in a distant future. This thus causes a favor for decisions or solutions affecting the short-term, whilst climate challenges comprise the long-term.

3.3.4 Negotiation

Different types of decisions rules exist. First is the rule of the majority that ‘wins’, with only few or no discussion. Second is voting, which can involve different weights or importance for different involved actors. Third is the unilateral decision rule, in which one person collects arguments of others, but eventually decides on its own. Last is consensus seeking, where it is tried to reach agreement among all involved actors by means of discussion. The latter is where negotiation is applied in the decision-making process. By means of negotiation, the areas of disagreement are tried to be reconciled in a flexible, speedy way (Yousefi et al., 2010). Moreover, “*whenever people engage in joint decision making to distribute resources, resolve conflicts, or (re)define interdependence, they are negotiating*” (Walton & McKersie, 1965 as in Kong and Yao, 2019).

Bazerman, Curhan, Moore and Valley (2000) provide a short history of the psychological study of negotiation. Cognitive patterns as described in the previous paragraph, strongly influenced the research on negotiation. During the 1980s and 1990s this caused a move in negotiation research towards behavioral decision research (BDR). At the core of BDR is the argument that people apply cognitive heuristics (Bazerman, 1998). These can lead to predictable mistakes, as elaborated in previous paragraph. Furthermore, BDR literature outlines systematic ways of deviation from optimality or rationality. These made it possible to make predictions of inefficient or inconsistent decisions. Other important findings during these years of research on negotiation are summed up in Table 1, which summarizes the elaborations from Bazerman et al. (2000).

Table 1: Behavioral decision research (BDR) in two-party negotiation, output from the 1980s and 1990s.

Effect	Reference (from Bazerman et al., 2000)
Positive framing tends to lead to more concessions of negotiators than negative framing does.	Bazerman et al., 1985; Bottom & Studt, 1993; De Dreu & McCusker, 1997; Lim & Carnevale, 1995; Olekalns, 1997
Anchors tend to inappropriately affect negotiators.	Kahneman, 1992; Kristensen & Garling, 1997; Northcraft & Neale, 1987; Ritov, 1996; Thompson, 1995; Whyte & Sebenius, 1997
Readily information tends to inappropriately affects negotiators.	Neale, 1984; Pinkley et al., 1995
Negotiators are tended to be overly overconfident and optimistic about the likelihood of favoring outcomes for themselves.	Bazerman et al., 1999; Bazerman & Neale, 1982; Kramer et al., 1993; Lim, 1997
Opportunities for 'growing the pie' (i.e., value creation) are missed by false assumptions of the negotiators that the pie is fixed.	Bazerman et al., 1985; Fukuno & Ohbuchi, 1997; Thompson & DeHarpport, 1994; Thompson & Hastie, 1990
Negotiators are tended to falsely assume that the preference of the other negotiator is incompatible with theirs.	Thompson & Hrebec, 1996
Conflicts are tended to get escalated by negotiators, even when rationality would dictate a change in strategy.	Bazerman, 1998; Bazerman & Neale, 1983; Bizman & Hoffman, 1993; Diekmann et al., 1999, 1996; Keltner & Robinson, 1993
Negotiators tend to ignore the perspective of others.	Bazerman & Carroll, 1987; Carroll et al., 1988; Samuelson & Bazerman, 1985; Valley et al., 1998
Negotiators tend to devaluate concessions of the other party.	Curhan et al., 1998; Ross & Stillinger, 1991

Continuing on the effects described in Table 1, four factors that are also important in negotiation are outlined by Bazerman et al. (2000). These are social relationships, egocentrism, motivated illusions, and emotion. Furthermore, the change in view on negotiation games from the output being only influenced by choices of the negotiators, towards the output being also influenced by how negotiators define and create the negotiation game on itself, led to new insights. Factors critical to this definition of the game are mental models, communication mediums, cross-cultural differences, and the organization and simplification of negotiators' understanding when the game involves more than two actors. This latter will be further elaborated, as it suits the scope of this study, concerning negotiating for group decision making.

Adding more negotiators to the negotiation process heavily increases its complexity (Bazerman et al., 2000). The variety of interests increases, which makes simple understanding already a complex task, sometimes even impossible. To cope with this increased complexity, simplification of the structure or organization of the interaction is applied. However, this is not without consequences for the outcome. One of those approaches is the use of one of the following decision rules, as elaborated in the start of this section: the majority rule, unilateral decision making or voting. The quality of the outcome of the negotiation, however, does decrease by adoption of one of these decision rules (e.g., Mannix et al., 1989;

Weingart et al., 1993). On the other hand, consensus seeking, or also referred to as unanimity seeking, improves the quality of the decision (e.g., Thompson et al., 1988).

Another approach to simplify multiparty negotiation is forming coalitions, by which the number of parties to come to an agreement reduces. The occurrence of coalition agreements is shown to increase with the increase of factors which have an influence on complexity. Examples of such factors are uncertainty regarding outcomes (Mannix & Blount White, 1992) or asymmetry between parties (Mannix, 1993b). Furthermore, the equality of the allocation of the result of the negotiation, and the number of included parties in the process, increases when involved actors care about future interaction with each other (Mannix, 1991, 1994).

Due to the increased complexity of multiparty negotiation, information overload can occur (Morely, 1982), which leads to increased use of cognitive heuristics (Bazerman et al., 2000). This, however, consequently means that more (predictable) mistakes will occur and quality decreases. Besides, additional complexity is likely to increase dissention about what a fair outcome is, leading to an increased chance of delays, stalemates, and impasses (Bazerman et al., 2000).

One critical element during negotiations is trust (Lewicki and Polin, 2013). Mayer et al. (1995) define trust as the willingness of an individual to accept others' vulnerability, based upon positive expectations that the individual has about the other's conduct. Due to the increased focus on relations in negotiation research in more recent studies, the importance of trust increased (Gelfand et al., 2006). The negotiation process is showed to affect the development of trust among negotiators (Campagna et al., 2016; Kong et al., 2014). Furthermore, culture affects the role of trust in negotiation processes (Kong and Yao, 2019). The meaning of trust differentiates across cultures (Kong and Yao, 2019). Trust can be deviated in three different forms: 1) interpersonal trust, which refers to the willingness to risk, 2) perceived trustworthiness, which refers to the perceived level of trust in one another, and 3) trust propensity, which is also referred to as generalized trust (Kong and Yao, 2019). The effects on negotiation regarding interpersonal trust are studied by Kong et al. (2014). They showed that trust caused integrative behaviors such as information sharing, which subsequently promoted joint gains. Furthermore, trust causes avoidance of distributive behaviors, which promote individual gains (Gunia et al., 2011; Hüffmeier et al., 2014).

Regarding the development of trust during negotiations a broad literature base is lacking. The existing research on trust in negotiations mainly has a static approach to investigate the antecedents of it (Lu et al., 2017), rather than dynamic to investigate the development of trust levels during negotiations (cf. Lewicki, Tomlinson, and Gillespie, 2006). The importance of analyzing trust development in a dynamic manner originates in the fact that trust is a psychological state at a certain moment in time. Thus, it can fluctuate over time (Kong and Yao, 2019), which makes dynamic analysis very appropriate.

In more recent studies on negotiation there is also deviated between 'fixed agreement' and 'fluid agreement' mindsets of negotiators (Friedman, Pinkley, Bottom, Liu and Gelfand, 2019). The former represents a mindset in which the agreements are solid and should be honored as agreed. Changes are a source of worry for this mindset. The latter represents a mindset in which contracts are perceived to be likely to change as a consequence of aspects such as emergent information, changing economic conditions and unforeseen project delays. Change is not perceived as worry or danger from this viewpoint. Early work on negotiations mainly concerned the 'fixed agreement' mindset, where agreement is the end phase of the process. This suggests that it is assumed that after reaching agreement, the actors instantaneously realize the aimed outcomes. However, this perception can be questioned, leading way for more research on 'fluid agreement' mindsets of negotiators and the process of

negotiating such agreements. The uncertainties and unexpected delays that are common in construction projects are examples where it is perceived difficult or even impossible to anticipate all contingencies needed to make a fixed approach for contracting work (Friedman et al., 2019). Therefore, a fluid approach for contracting is expected to be much more beneficial for projects exposed to high uncertainties.

3.3.5 Conclusions

Group decision-making is present in all sorts of fields, also while implementing innovations in the context of sustainability transitions. Reason is that for transitions to occur, multi-dimensional, large-scale challenges are to be solved, for which multiple actors must collaborate and thus make decision together. When improving the quality of the outcome of the group decision (e.g., by increased understanding of mixed-motives, information sharing, etc.), the success of implementing innovations contributing toward sustainability transitions, increases.

Group decision making literature provided insights in the cognitive patterns underlying individual motives, which in turn affect group decision making processes. Groups are expected to make decisions as motivated information processors, where they have a certain epistemic and social motivation on the individual level. These motivations respectively affect the depth and bias in information processing on individual level, and on the group level the process of information dissemination and integration. The latter is also influenced by the bias and depth of information processing on individual level and eventually affects the quality of the group judgment or decision. Knowing this process and adding to it cognitive patterns, expectations regarding group decisions and motivations within the innovation implementation process in the given context are constructed.

Insight 2; The MIP-G perspective can be complemented with a temporal dimension affecting motivation.

Namely, the choice between immediate self-interest and longer-term collective interests. This addition to the MIP-G perspective is based upon the cognitive patterns ‘overly discounting the future’ and ‘vividness’. The pattern of overly discounting the future can be explained by the deduction of the importance of the future over time, leading to preferences for short-term solutions. Vividness causes a favor for the pro-self, short-term solution, due to the ‘availability’ heuristic. This heuristic describes that when people have to estimate the frequency of an event to happen, they will indicate a higher frequency when they can more easily recall an event, which is the case for a more nearby future or past, and for events that affected themselves instead of others. Moreover, as a result of high uncertainty and low trust, social dilemmas are tentative toward pro-self, short-term solutions as well. As uncertainties are generally high in transitions, this confirms the expectation of a pro-self, short-term motivation in group decision making.

Insight 3; A pro-self, short-term motivation of group members is expected to negatively influence the success of the implementation process (and opposite for the pro-social, long-term motivation).

Projecting the expected type of motivation of group members (i.e., expectation one) on the field of sustainability transitions suggests the occurrence of a misfit between actual motivations and motivations required for the desired outcome. Reason is that sustainability transition projects often comprise long-term, collective goals. A pro-self, short-term motivation would thus lead to lower quality decisions which subsequently negatively influences the implementation success. This process holds the other way around as well; a pro-social, long-term motivations of group members are expected to positively influence the success of the implementation process.

Regarding negotiation literature, key aspects that stood out are trust, uncertainties and time aspects. These aspects will be discussed in more detail in the next section.

3.4 Factors influencing the implementation of innovations

Based on the discussed topics in the previous sections on change management and group decision making, further elaboration follows regarding: 1) uncertainties, influencing social dilemmas and information availability; 2) trust, influencing uncertainties and beliefs in negotiation partners; and 3) time aspects. These three aspects are chosen to be further elaborated due to their great impact in both theoretical fields (i.e. that of change management and group decision making). These aspects affect the chances of successful change within organizations (i.e., whether the organization changed aligned to the objective of the change; Hayes, 2002) and the quality of the outcome of group decisions (De Dreu et al., 2008). Furthermore, the three aspects underly cognitive patterns and negotiation processes in various ways. Finally, transitions are characterized by uncertainties (Ahlborg et al., 2019; Folke et al., 2016; Geels, 2006; Grin et al., 2010, Köhler et al., 2019; Meijer and Hekkert, 2007) and take place over a long time period (Geels, 2006; Genus and Coles, 2008), which makes time and uncertainty essential aspects for understanding of the transition process.

3.4.1 Uncertainties

In multiple social dilemma experiments, characteristics of the dilemma are available to all participants, without presence of uncertainty (Van Lange et al., 2013). However, in real life situations, there is often a level of uncertainty present in social dilemmas (Suleiman & Rapoport, 1988). This uncertainty is reducing the willingness to cooperate among participants (e.g., Budescu, Rapoport, & Suleiman, 1990; Gustafsson, Biel, & Gärling, 1999). According to Gustafsson et al. (1999), uncertainty results in an overly optimistic estimation of the required resources. Van Dijk et al. (2004, 2009) state that uncertainty simply functions as an excuse for non-cooperative behavior of involved actors, and that the efficiency of coordination decreases. When the criticality of actors' behavior for the realization of public goods is perceived to be low, the effect of uncertainty decreases, or uncertainty may even slightly promote cooperation (Chen, Au, and Komorita, 1996). This finding corresponds to the notion of 'member input indispensability' in the MIP-G model, where the degree to which the input of group members is critical, moderates the relationship between information dissemination and integration and the quality of group judgment and decision. So, when indispensability is low, the strength of the effect of information dissemination and integration on the quality of group judgment and decision decreases. Therefore, it is important to gain knowledge regarding the criticality of people's behavior for the project outcome, the level of uncertainty that is present in the project, its effects on cooperation, and the potentially complementary cause(s) of non-cooperative behavior if present.

Insight 4; In literature ambiguity exists regarding the effect uncertainty has on cooperative behavior.

Next to cooperative behavior in relation to uncertainties, its effects on value creation are studied. Value creation is perceived as goal of projects in general (Browning, 2014). It is created when most efficient resources, considering time and money, are used to reliably acquire the desired function that meets customer expectations (Stewart, 2010). In Stewart's description of value creation, the term 'reliably' is incorporated, to indicate the presence of uncertainties. Browning (2014) and Loftin (2014) show that these uncertainties threaten the goal of value creation and thus project success. The former imputes this threat to the increasing complexity that the overload and lack of information about so many people, tasks, tools, components, and possibilities causes, and subsequently increases the difficulty of making a

decision. Loftin (2014) refers to uncertainties as unanswered questions, that decrease stakeholder support and political will, which are argued to be essential for value creation in projects. Contrasting are the findings of Hertogh and Westerveld (2010), indicating potential positive consequences of uncertainty. They outline the potential of a decrease in effects originating in ‘bounded rationality’ of decision makers, caused by for instance historical path dependency. Further investigation of the effects of uncertainties on the process of implementing innovations contributing to sustainability transitions and of potential approaches (if any) to transform it into a positive consequence for the project outcome, appears necessary to clarify the ambiguity concerning this topic and to improve opportunities for value creation in sustainability transitions.

Insight 5; In literature ambiguity exists regarding the effect of uncertainty on value creation in projects.

According to change management literature, having a clear interpretation of the desired future state, is a key situational variable for the success of a change (Hayes, 2002). Uncertainty is expected to complicate obtaining such interpretation, which in turn might complicate the management of change processes. The innovation implementation process partly overlaps with change management, as it requires changes within organizations, in the contact among organizations and in approaches to the project. Therefore, uncertainty is expected to increase complexity in projects in the given context of this study.

Insight 6; The complexity of the management of the innovation implementation process is expected to increase as a result of uncertainty.

3.4.2 Trust

Trust is defined as “*a psychological state comprising the intention to accept vulnerability based upon the positive expectations of the intentions or behavior of another*” (Rousseau, Sitkin, Burt, & Camerer, 1998, p. 395). This vulnerability is based upon a certain uncertainty or risk level, caused by others having control over outcomes. Besides, positive expectations often imply belief of the cooperating intentions or behavior of others (Van Lange et al., 2013; Evans & Krueger, 2010). Higher trust levels are showed to cause increased cooperation in response to another person’s intention to cooperate (Parks, Henager, & Scamahorn, 1996). Van Lange et al. (2013) indicate the increased importance of trust at presence of uncertainties or doubts about other’s intentions or behavior, and at high degree of conflict among one’s own and others’ outcomes.

Trust is influenced by individual factors such as preferences, cognition and behavior, as well as by organizational factors, such as a vision or expectations. Furthermore, inter-personal and inter-organizational relations play their part as well (Savolainen, 2010). Thus, trust and its development in the negotiation process is a dynamic, multi-level, inter-personal and inter-organizational process (Lopez-Fresno, Savolainen, and Miranda, 2018). Trust is the foundation of collaboration (De Dreu et al., 2006) and contributes to reaching a more integrative agreement (Bazerman and Neale, 1992; Ferrin et al., 2011). When trust is violated, it is hard to restore it (Savolainen et al., 2017; Zheng, Zhang, and Wang, 2018) and due to its fragility, it is difficult to build and maintain it (Kramer and Lewicki, 2010; Williams and Belkin, 2016). Trust concerns human interaction and therefore is not fully predictable or controllable (Mayer et al., 1995). Emotions are an important predictor for trustworthiness, via perceptions about sociability, morality and competence of the others (Mayer et al., 1995; Belkin and Rothman, 2017). Another important factor influencing trust levels is cultural and language differences (e.g., Lewicki and Polin, 2013; Fulmer and Gelfand, 2012). Finally, distrust is shown to decrease

outcome quality of negotiations (Gunia et al., 2014; Lewicki and Polin, 2013). This also holds the other way around; increased trust tends to improve the quality of the negotiation, due to improved information exchange (i.e., more open, timely and with the correct amount of information; De Dreu et al., 2006, 2008; Lopez-Fresno et al., 2018). Furthermore, interorganizational trust, as type of relational governance, is showed to be critical in managing interorganizational relationships in the construction contracting setting (Wong and Cheung, 2005).

Another important concept in the literature regarding trust is reciprocity, as trust is developed in a *“process of reciprocal responses to presumed trustworthy behavior”* (Pieperhoff, 2018, p.1). Pieperhoff distinguishes three phases of inter-organizational exchange, forming, establishing and broken. During the forming phase, actors approach each other and are building a relationship. In the establishing phase a relationship exists, which can be long- or short-term and during which regularly information exchange takes place. In the broken phase the information exchange among actors ends. She argues that for each of those phases different reciprocity types can be distinguished. These types are positive direct (i.e., immediate, direct exchange), positive indirect (i.e., indefinite, future exchange) and negative (i.e., negative, one-way exchange). For the forming stage, direct and indirect reciprocity becomes effective, whilst for the established phase only direct reciprocity is. Negative reciprocity leads to ending of the relationship. Thus, when companies are in the forming phase, any form of reciprocity contributes to build a sustainable long-term relationship and during the established phase, only direct exchange contributes to maintenance of the relationship (Pieperhoff, 2018).

To conclude, trust is outlined in literature as critical aspect during negotiations. However, literature analyzing the development of trust among negotiators during a negotiation process is limited (Lewicki et al., 2006; Kong and Yao, 2019). Existing research on trust in negotiations has a mainly static approach to investigate the antecedents affecting it (Lu et al., 2017). Thus, there exists a gap in knowledge regarding the development of trust in negotiation processes, whilst improved understanding regarding this dynamic development of trust is expected to improve the outcome of the negotiation and therefore also the implementation success of innovations in the context of sustainability transitions. This led to the following expectation.

Insight 7; A process analysis of the development of trust among negotiators during a negotiation process would add to existing knowledge regarding trust in negotiation literature.

From the work of Hattori and Lapidus (2004) it became clear that in a collaborative setting, which is expected to be required for innovation implementation in the context of transitions, a highly invested state of trust is necessary. Motivations of involved actors should be focused on the good of the whole (instead of individual gains). The outlook should be synergy, behavior should be responsible, and the potential outcome is a breakthrough innovation. The employment of this strategy, and its functionality, for a collaborative relationship can be tested in the context of implementing innovations contributing toward sustainability transitions.

Change management literature states that a collaborative approach to change should be adopted for cases where there is low urgency, an unclear desired end state, anticipated upon great resistance, information from stakeholders is required, trust in change managers is low, and successful implementation of the change plan is highly dependent on commitment and efforts of others (Hayes, 2002; based upon Kotter and Schlesinger, 1979). Note the low trust starting point stated by Hayes (2002), whilst Hattori and Lapidus (2004) argue a highly Combining the work from Hattori and Lapidus (2004) and Hayes (2002), led to the following insight.

Insight 8; A collaborative setting is required for implementation success in the given context and can be realized by means of;

- a. A highly invested state of trust;**
- b. Motivations focused on the collective good rather than on the individual good;**
- c. Synergy outlook;**
- d. Responsible behavior.**

3.4.3 Time aspects

Time is widely acknowledged as factor in decision making processes and (change) management. There exists a broad scope of factors regarding aspects of time, such as the examples listed below. An overview of literature on temporal aspects can be found in Table 6 in Appendix A.

- One's perception of time, which can be clock-time or process-time oriented (e.g., Adam, 2019; Reinecke & Ansari, 2017);
- Time pressure (e.g., Kelly and Loving, 2004);
- Speed of decision making (e.g., Barkema, Baum and Mannix, 2002; Evans and Van de Calseyde, 2016; Perlow, Okhuysen and Repenning, 2002);
- Urgency (e.g. Chen and Nadkarni, 2017; Kunish et al., 2017; Karau and Kelly, 1992, 1999, 2004);
- Temporal horizons or focus (e.g., Crilly, 2017; Flammer and Bansal, 2017; Nadkarni et al., 2016);
- Pacing style (e.g., Barkema et al., 2002; Chen and Nadkarni, 2017; Gevers, Rispens, and Li, 2016);
- Temporal consensus (e.g. Gevers, Rutte and Van Eerde, 2004; Gevers, Van Eerde, Rutte, 2009).

Reinecke and Ansari (2017, p.2) discuss temporality, which is defined as “*what time is, and how time is experienced and socially organized*” and it is shown to differ within and across individuals, organizations, cultures, geographies, and societies (Adam, 1995; Bluedorn & Waller, 2006). There are two generally accepted perceptions of time defining temporality; clock time and process time. Clock time (e.g., Reinecke & Ansari, 2015, 2017), or ‘our time’ (Adam, 1995), is widely considered to be the ultimate expression of time created by humans. Clock time is separated from any cultural or other context (i.e. independent), thus, runs ‘objectively’. It is steered by the number system, instead of directed by change. Opposite perception of time is process time (Reinecke & Ansari, 2015), also referred to as event time (Brown & Eisenhardt, 1997; McGivern et al., 2018; Dougherty et al., 2013), or ‘other time’ (Adam, 1995). It is described according to the following characteristics.

- Learning-oriented (Brown & Eisenhardt, 1997; Dougherty et al., 2013);
- Subjective, qualitative (Dougherty et al., 2013; McGivern et al., 2018; Reinecke & Ansari, 2015);
- Open-ended, relational, processual, concerning historical wicked problems (McGivern et al., 2018);
- Relative, organic, cyclical (Reinecke & Ansari, 2015);
- Nonlinear, dynamic, and requiring deep understanding of the situation (Dougherty et al., 2013).

Understanding these two perceptions of time serves as basis for further elaboration of the other listed temporal aspects.

Temporal consensus, also referred to as shared temporal cognitions, is defined by Gevers et al. (2004, p.67) as *“the agreement among team members on the appropriate temporal approach to their collective task”*. They argue that this agreement contributes to the coordination of team members’ actions. This coordination can also be reached within teams by unconscious ‘entrainment’ (Gevers et al., 2004). Entrainment is defined as *“the adjustment or moderation of one behavior either to synchronize or to be in rhythm with another behavior”* (Ancona & Chong, 1992, p.2). For other cases, where no entrainment occurs unconsciously, it can be steered upon by creation of shared cognitions on time. These can be obtained by means of goal setting, temporal planning and temporal reflexivity. Marks, Mathieu and Zaccaro (2001, p.365) define goal setting as *“the identification and prioritization of goals and subgoals for mission accomplishment”*. Goal setting has direct influence on task performance (Locke & Latham, 1990), both for groups and individuals. Involving all actors in the goal-setting process, increases understanding of the importance and urgency of set milestones and of other performance indicators that may be compromised in order to meet deadlines (Gevers et al., 2004). Secondly, temporal planning positively influences performance during periods with high time pressure (Gevers, Van Eerde, & Rutte, 2001). Reasoning behind this is the shared understanding of required information sharing and needs of team members. Gevers et al. (2004, p.77) define temporal planning as *“the strategy formulation on how to use time for goal accomplishment”*. It encompasses a) an estimate of the time it costs to accomplish certain subtasks and setting milestones for these, b) the order and timing of actions and the flow between team members, c) individual’s time constraints and temporal preferences. Resulting are consistent expectations among team members and maintains attention towards the task. Third is the temporal reflexivity of a group, defined as *“the extent to which group members collectively reflect upon the group’s objectives, task strategies, and internal processes, and adapt to current and anticipated endogenous or environmental circumstances”* (Gevers et al., 2004; West, 1966). Temporal reflexivity affects the shared cognitive representation of work within a group, which enables it to be adaptive and effective, especially when operating in uncertain and dynamic circumstances (West, 1966). Furthermore, Gevers et al. (2001) show that due to reflexivity, more deadlines are met. When exposed to high time pressure, reflexivity benefits timely task completion (Gevers et al., 2004). Thus, temporal reflexivity is argued to be extremely suitable to situations where performance gaps or unexpected events occur, due to that it enables the team to guide and direct their temporal performance and build a shared perspective on the adaptive actions that are required. Temporal reflexivity can also resolve conflict between executives’ temporal horizon for decision making and the appropriate temporal horizon for the project when considering the endogenous circumstances. Oftentimes maximization of immediate returns is prioritized by executives over long-term competitive advantage (Crilly, 2017). However, one of the main characteristics of transitions is the long-term time horizon they comprise (Geels, 2006). Therefore, this can cause conflicting time horizons.

Temporal reflexivity is also outlined by Reinecke and Ansari (2015) in their analysis of the temporal structure of two units of an organization, one being a producer-oriented standards setter, one a market-oriented certifier. The first focused on emergent processes enabling development, the latter focused on certification outcomes and monitoring these in the role of auditor. These two units differed in their view of development (linear and non-linear), their orientation (Southern producers and Northern markets), and in their practices to develop (process- and outcome-based promotion of development). This led to negotiation among the units regarding the following topics:

- Moving picture (“in-between” process, complexity) vs. snapshot (static, concrete entities for objective measurement) to capture development;

- Plural (various development pathways, temporal asymmetry) vs. uniform timelines (consistency of certification decisions, temporal symmetry);
- Long-term (impact over generations) vs. short-term (immediate impact) temporal depth (i.e. “temporal distance into the past and future”, Reinecke and Ansari, 2015, p.634).

Reinecke and Ansari (2015) provide two mechanisms for the units to improve collaboration and reach more alignment in temporality. They refer to it as an ‘ambitemporal approach’. Firstly, they argue that recognizing plural temporalities (i.e., temporal reflexivity) creates the opportunity to research how different temporal structures affect development. Secondly, the linking of development and credibility gaps is argued to lead to the units becoming more appreciative of their interdependencies, as choosing one of the two ‘sides’ would lead to a compromise on their common goal. Focusing on market temporality would result in a ‘development gap’, focusing mainly on development temporality would result in a ‘credibility gap’. Orlikowski and Yates (2002, p.698) also refer to the concept temporal reflexivity and define it as “being aware of the human potential for reinforcing and altering temporal structures”. They state that it is essential if it is desired to act effectively in our world.

Reinecke and Ansari (2017, p.8) indicate that temporal structures in general “*shape what problems appear salient, how those problems are coped with and what constitutes satisfactory solutions*”. The first part, what problems appear most important, is expressed in urgency and prioritizing, which represent respectively the perceived necessity of a certain action or decision, and the order of execution of these action or decision making based upon their perceived importance. The perceived urgency is influenced by the amount of time pressure that is experienced (Karau & Kelly, 2004). Karau and Kelly (1992) showed that performance when exposed to time pressure differs for different quality types. The length (i.e. the number of words of the written solution divided by the number of minutes in the interaction) is longest when exposed to most time pressure. On originality, creativity and adequacy, the most time pressure groups performed much lower than the other two groups. Notable is that on originality and creativity, the medium time pressure group performed best. Regarding the adequacy, issue involvement, quality of presentation, optimism, and action orientation the lowest time pressure group performed best, followed by respectively the medium and highest-pressure groups. In their 1999 study, Kelly and Karau indicate the enhancing effect of time pressure on the initial preferences of team members being the determinants of the group decision. In other words, initial preferences of individual group members influence the made group decision, and this effect is strengthened by time pressure.

Next temporal aspect to discuss here is the speed of decision making. Perlow, Okhuysen & Reppenning (2002) refer to speed as how fast decisions have to be made. They argue that it is critical to organizational success. However, an emphasis on speed can have a negative effect on organizational success as well, which is referred to by Perlow et al. (2002) as the ‘speed trap’. Defined as “*the reaffirmation of the mutual causality between action and structure*” (Perlow et al., 2002, p.947). In other words, as a decision is made, this influences the environment, which in turn influences the next decision-making process. Perlow et al. (2002) made a causal loop diagram from the decision-making process in the case they analyzed, which showed the ‘speed trap’ process in the form of several reinforcing and some balancing loops indicating consequences of fast decision making. For instance, the increased user number goal or the increased burn rate as consequences of increased decision speed and in turn increased capacity. While speed requirements or boundaries are oftentimes assigned to exogenous features of the environment, the necessity for fast action can also be the result of an emphasis on speed of the organization itself.

Another aspect of time, gate slippage, is discussed by Van Oorschot, Akkermans, Sengupta and Van Wassenhove (2013). The authors analyzed the process of complex new product development projects. Gate slippage is defined as stretching current project stages at the expense of future stages. It is applied in response, as a 'fix', to a performance gap, which subsequently caused schedule problems. By applying gate slippage, the duration of the stage increased and in turn the required performance decreased. However, the authors also provided insights in the unintended side effects of gate slippage, by means of a CLD. One of the unintended effects were the increased schedule problems for the overall project, as less reserves in time (i.e., slack) was left due to the gate slippage practices. Information filters prevented the teams to notice what was happening until it was already too late.

To conclude, several temporal aspects can play part in the successful implementation of innovations contributing toward sustainability transitions. For instance, teams can be trapped by the 'speed trap' where they make decisions too fast and end up in a reinforcing loop of increased decision speed (Perlow et al., 2002). Also, they can try to fix schedule problems by gate slippage, which in turn, after some time, only further increases schedule problems (Van Oorschot et al., 2013). Moreover, the temporal cognitions and horizons for decision making of the involved actors can differ, which is showed in literature to negatively affect performance of the group in several ways (Crilly, 2017; Gevers et al., 2004; Reinecke and Ansari, 2015). Shared temporal cognitions can be developed by means of goal setting, temporal planning and temporal reflexivity (Gevers et al., 2004). In this study, the effects and presence of shared temporal cognitions on the implementation process can be analyzed, as well as the presence of approaches to improve it if necessary.

Insight 9; Shared temporal cognitions (STC) improve performance of a team and can be developed by means of goal setting, temporal planning and temporal reflexivity.

3.5 Conclusion

Concluding from the literature review, it is found to be promising to combine the fields of knowledge regarding group decision making and change management, and integrate them by means of analyzing the underlying mechanisms steering the internal process of implementing innovation in the field of sustainability transitions. By means of this analysis the nine insights are reflected upon and new insights resulting from the explorative nature of this study are added to it. This led to the following research question for this study.

RQ: "What dynamics underlie the negotiation process of implementing innovations in the context of sustainability transitions?"

4. Method

In order to study the dynamics underlying the negotiation process of implementing innovations in the context of sustainability transitions, it was required to gain insight in causes-and-effects and their development over time during the negotiation process. Therefore, a process research approach was applied, combined with systems thinking (Langley, 1999; Langley et al., 2013; Sterman, 2000). As the aim of the study is explorative in nature, an in-depth case study was conducted, concerning the implementation of a sustainable innovation in an urban area development project. This method is suitable for explorative studies as it leads to deeper understanding and offers context (Dyer and Wilkins, 1991; Gibbert et al., 2008). For data collection, a multimethod approach was applied (Brewer and Hunter, 1989), as interviews and a document analysis were used. The study comprised four main steps. At first, a description of the project and its process (i.e., case narrative) was retrieved by means of an unstructured interview and extensive document analysis. Second, nine interviews were conducted for exploration of the underlying mechanisms steering the process. The third step comprised a translation of the retrieved information into a Causal Loop Diagram (CLD; see Sterman, 2000), a tool for visualization of dynamic processes. To validate the findings, a reflection session with two experts from practice was organized, in which they discussed the completeness and correctness of the CLD (step four). By means of state-of-the-art literature, theoretical validation and reflection was provided.

4.1 Data collection

The data used in this study came from both primary and secondary qualitative sources. All data was longitudinal data, obtained with archival and reflective field observations. Longitudinal data is a necessity for process research (Langley et al., 2013). Qualitative data is used to reveal mechanisms steering behavior (Hammarberg et al., 2016) and thus is particularly appropriate for explorative research. As stated in the introduction of the method section, four approaches of data collection were used; an unstructured interview, document analysis, semi-structured interviews and an expert validation round. In total, the data collection and analysis process consisted of four steps, discussed in this section (summarized in Figure 8).

4.1.1 Case narrative

The first step of data collection was in purpose of the construction of a case narrative. This case narrative consists of a timeline and a case description, that provided insights in the major issues, decisions, events and developments. It was built upon two types of data sources, interview data from one interview (data source A in Figure 8) and an extensive document analysis (data source B in Figure 8). The interviewees were two employees of Witteveen+Bos, hired by Partnership They provided technical and administrative advice and control in the project and were involved already in the starting phase of the project. It was an unstructured interview with these two project members simultaneously. Use of this interview method is appropriate for this situation, as the interviewees provided only general, fact-based information during the interview to get familiar with the project. Therefore, a structured interview does not add value to the data quality. The information from the interviews was to be confirmed by means of the project documentation. For instance, information regarding important dates in the process, such as signing the development agreement. The interview is recorded and documented by means of a meeting minute combined with a timeline sketch. Distinct phases were uncovered in the timeline and were further specified by means of the extensive document analysis.

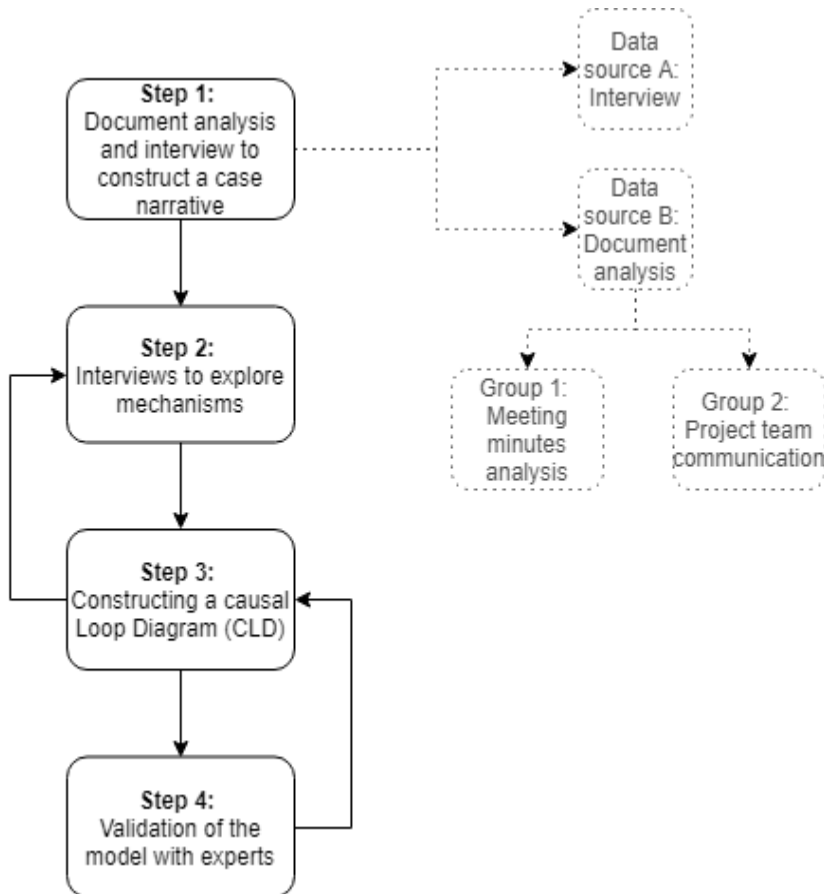


Figure 8: Process steps

Next to further specification of the identified phases and validation of those phases, the document analysis was conducted to generate deeper understanding of the case. The analyzed documents comprised 660 agendas and minutes of meetings on all decision making levels, all e-mails sent among the project members, reports (both formal and informal) regarding the progress of the collaboration (e.g., describing risks, difficulties, opportunities and goals), advisory documents for the purpose of decision making, project plans (e.g., tender proposal), and (spatial or time-based) planning documents. In total, the document base contains over a thousand files.

4.1.2 Exploration of the dynamics

To further explore the dynamics (i.e., behavior in the studied process), nine interviews were conducted (step two). The respondents are people who worked or are working on the Expo project at various levels; from project director level to team member level. They are selected based upon the document analysis. All involved parties are represented (i.e., Heat supplier, the heating supplier; Partnership, the developer; Witteveen+Bos, consultant; Consultant 2, consultant). The list of interviewees can be found in Appendix D. In this list, the period during which the interviewees were involved in the project is denoted as well. The used interview protocol can be found in Appendix E. The interviews were recorded and transcribed to be able to systematically analyze them. From the insights from analysis a table with mechanisms and cause-and-effect relations followed, which was used for the next step in this study.

4.1.3 Construction of the causal loop diagram

Having a clear interpretation of the dynamics that are present in the case, these were visualized by means of a Causal Loop Diagram (CLD; Sterman, 2000), which forms the third step. This tool offers the

possibility to present processes as linked states and flows, forming feedback loops. Thus, the processes depart from their origin and eventually end up exactly where they started. This differs from what in conventional variance studies would be represented as just concepts and causal linkages (Langley et al., 2013). Therefore, CLDs are particularly useful as analytical and communicational tool in process studies such as this. The data used for this visualization consists of the interview data structured in cause-and-effect and mechanisms tables, complemented by results from the document analysis. No further data was collected during this phase.

4.1.4 Validation of the causal loop diagram

For validity and reliability tests, the CLD was discussed during an expert group discussion and is compared to existing theoretical frameworks. This is the last and fourth step of data collection and analysis. The practical validation involved one meeting with two experienced project directors in the field of urban area development. One is working at Witteveen+Bos and one at DevelopCO. The CLD was send to both experts prior to the meeting, so they could prepare their own reflection. During the session, first, the model was talked through, step by step, as it is described in the first paragraph of the results section of this study (i.e., episode one to three). Both of the experts were asked to give their opinion and discuss what they recognize and what not. The role of the interviewer was to explain how a CLD must be understood, and to facilitate the discussion. Furthermore, it was important to sometimes act as the devil's advocate (e.g., as used in health research, see MacDougall and Baum, 1997), in order to prevent from groupthink, where censoring and conforming influence the outcomes of the group discussion (Janis, 1982). The meeting was recorded and transcribed, so that results could be systematically analyzed.

4.2 Data analysis

The collected data is analyzed according to the four steps described in preceding section 4.1 Data collection. This section comprises further elaboration on the analysis of the various data sources.

4.2.1 Case narrative

The general case narrative, being *“a data organization device that can also serve as a validation tool”* (Langley, 1999: 695), is constructed from the interview data and project documentation. First objective of constructing the case narrative was exploring what were the distinct phases of the project. In order to uncover these phases, an unstructured interview was held with two project team members that were involved in the project during the whole process. Aim was to establish a chronological visualization and description of the process, which created the opportunity to simultaneously perform a first rough analysis of the overall process of implementing the STG. During the interview the first sketch of a timeline was made and during the document analysis this sketch was formalized into the final timeline.

Second objective of the case narrative was obtaining insights in the most frequently discussed topics during meetings, via email contact and in formal and informal reports. This provided understanding in the major concerns, challenges and opportunities present in the project.

Third objective of the case narrative was increasing understanding of the decision-making processes that were present in the Expo project. In order to, differences in discussed topics on various hierarchical levels and during the various phases of the project were described. Understanding of the decision-making processes regarding the implementation of the STG into the Expo project, contributes to the general understanding of the complexity and process routine within the project.

The collected data from the project documents was systematically analyzed. In the files from the document analysis information regarding the main actions, decisions and events during the project was searched for. Besides, the analysis comprised a first exploration of key recurrent topics in the discussions during the process of implementing the innovation, the STG. To add structure to the analysis, the documents were firstly divided into two groups (Figure 9); 1) the minutes of meetings from the level of ‘board and councilor’ to ‘project leader’ (blue to yellow), and 2) the communication on ‘project staff member’ level (green). These two groups were analyzed separately, as the data in the first group comprises the discussion of the total project (i.e., not only regarding the heating solution), whilst the data from the second group is focusing specifically on the heating solution. For this reason, different approaches of analysis were appropriate, as discussed in the next paragraphs. Both groups of data were analyzed using QDA Miner Lite, a digital tool for qualitative data analysis.

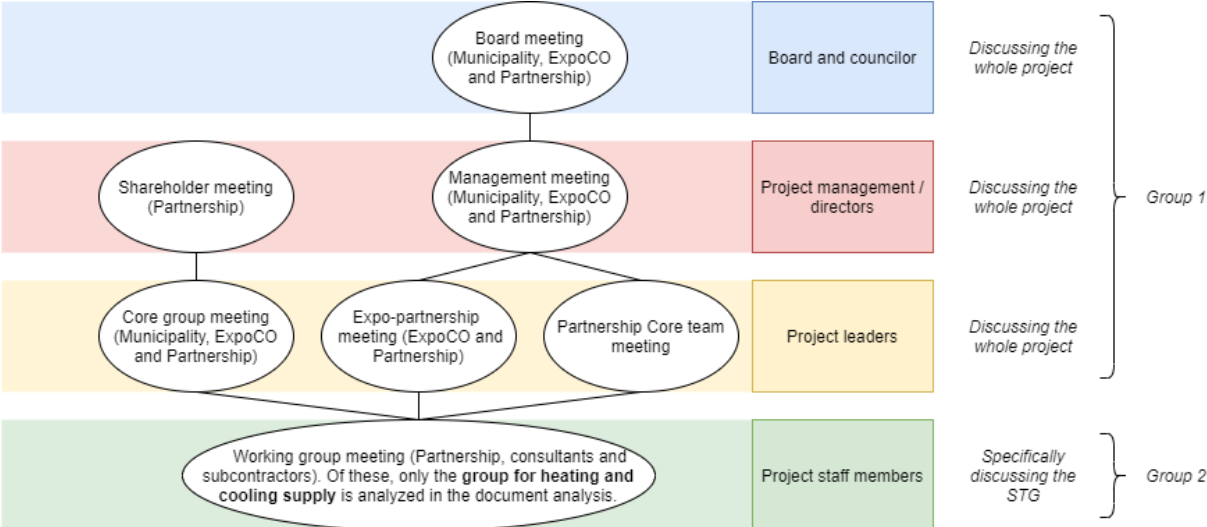


Figure 9: Decision making levels (escalation levels) and their scope

The codification of the data of the two groups were according to one code category; ‘topics of discussion’ (Table 2). For this code category a coding scheme was established. This was done by identifying which topics were recurring multiple times in the documentation of both groups. The coding scheme, including codes, code descriptions and example quotes, can be found in Table 3.

Table 2: Code category used in the document analysis

Code category	Category definition
Topics of discussion	The topics that are discussed during meetings

Table 3: Coding scheme group one, coding category topics of discussion

Code	Description	Example quote
Ambitions and goals	This coding segment discusses the aims of the overall Expo project, related to the STG, described by means of goals and ambitions. Of those the goals are ‘hard’ boundaries, whilst for the ambitions there is only an obligation to investigate the opportunities regarding it (‘soft’ boundaries).	“By using a combined soil energy system, both the objectives and the ambitions from the tender come within reach”

Business case and financial aspects	These segments discuss financial feasibility of the STG, consisting of the business case, but for instance also financial guarantees provided by the municipality.	<i>“At the maximum program of approximately 1800 houses, the business case for the energy system is viable”</i>
Organization, collaboration and contracting	Comprises aspects such as trust, contracting processes, clearness of communication, attitudes, transparency, knowledge, expectations and interests of the actors, related to the STG.	<i>“Signing the exclusivity between Heat supplier and PARTNERSHIP is forthcoming” “Heat supplier has a collaborative attitude” “Together with Heat supplier no final agreement is reached yet” “For the time being it seems that there is no agreement with Heat supplier”</i>
Spatial feasibility	This concerns the adaptation of users, the spatial plan of the municipality, spatial arrangements and the scalability, all related to the STG. This segment includes mainly the discussion of the topic real estate development.	<i>“PARTNERSHIP always provided insights in the certainty of real estate developments [...] to provide VF the necessary assumptions in order to be able to develop the STG” “Adaptation by users is important, it has to work”</i>
Technical features and feasibility	This segment consists of the availability of heat in the soil and from datacenters. Furthermore, it covers the flexibility in use, the choice of electrical energy system, and other, generally discussed technical feasibility related to the STG.	<i>“Substantive design progress of the STG is still unclear at this moment in time. Study results and status of the study on connecting the datacenter are unknown.” “PARTNERSHIP agrees with the technical assumptions for the energy system conform the note ‘Technical assumptions energy provision buildings’”</i>
Temporal aspects	All time related aspects, such as deadlines, planning, speed of development, response times etc. that is discussed in relation to the STG.	<i>“The guarantee is necessary right now, because Heat supplier’s engineering is critical for the start of the construction of the cables and ducts (starts Q3 2019)” “At a certain moment we have to make a decision and determine the energy strategy, with or without HEAT SUPPLIER, based upon the available knowledge and commitments” “STG with another party: therefore it’s actually too late”</i>

First group: Meeting minutes (including appendices) of the top three levels

The documentation in the first group consisted of meeting minutes and the appendices belonging to those meetings (i.e., discussed or shared during or prior to the meeting). An example of such appendix is the final development plan. This set of documents covered the most important themes of discussion in the project and therefore was a very appropriate data source for the first objective of the case narrative step.

The analysis of the data in this group was performed according to the following steps. At first, search terms denoting the name of the innovation or related subjects, were used to filter what is of importance

to the specific scope of this study. These search terms were: “Smart Thermal Grid”, “STG”, “warmte”, “energie”, “energieconcept”, “heating”, “energy”, “energy concept”, “Heat supplier” and “Heat supplier 2”. As the documentation is mainly in Dutch, and only a few files are in English, search terms in both languages were used. The paragraphs that contained one of the terms, were coded as ‘discussing STG’. This resulted in nearly 300 paragraphs, of which some showed up several times, as some task lists, for instance, were recurring in multiple minutes. These paragraphs were then read and recurring topics that influence decisions were coded according to the coding scheme in Table 3.

Second group : E-mail correspondence (including appendices) on project level

For the second set of data the analysis did not include a filter by means of search terms. Reason for this was that, contrary to the meeting minutes, all of this project level communication was about the heating solution, as only project level data for the specific work group on energy solutions was collected. Thus, all communication was relevant to the scope of the study. Furthermore, the analysis was similar to that of the first group of data. As such, the coding scheme that was used for the second group can as well be found in Table 3.

4.2.2 Exploration of the dynamics and construction of CLD

The data collected via the interviews were also analyzed according to a coding scheme. However, as the interviews were semi-structured, not all respondents discussed similar topics. In fact, there was a wide variety of topics discussed during the interviews, which made the interviews difficult to analyze. However, by means of the grounded theory approach (Glaser and Strauss, 1967; Strauss and Corbin, 1994), systematical analysis was executed. It comprised four levels; codes, concepts, categories, and theory. Respectively, these encounter 1) the anchors that allow key points of data to be gathered, 2) groups of *codes* that have similar content, 3) groups of *concepts* that are used to build theory, and 4) the collection of *categories* describing the research subject. The steps that are executed are coding and theorizing, memoing and theorizing, and integrating, refining and writing up theories. Aim was to identify and explain dynamics influencing the decision-making process (i.e., negotiation process) with the objective to implement an innovation supporting the sustainability transition. Furthermore, the method of constant comparison was applied to analyze differences and similarities between results from the various interviews. More specific, the following four stages from the constant comparison method were walked through: 1) comparing incidents applicable to each category, 2) integrating categories and their properties, 3) delimiting the theory, and 4) writing the theory (Glaser and Straus as in Dye et al., 2000, p.1/2). By means of constant comparison of events with previous events, new relationships were discovered throughout the process of data collection and analysis (Dye et al., 2000). The stepwise approach led to the coding scheme from Table 4. The process of constructing an CLD was an iterative process in which sketches of causal relationships were made.

Table 4: Coding scheme for the interviews, consisting of the concept name and definition and the categories

	Categories		Concepts	Concept definition
A	Uncertainties and risks	1	Perceived uncertainties	When a reference is made to the degree of perceived uncertainty and the effects that it has on the project or will have
		2	Real uncertainties of the scope	When a reference is made to the real uncertainties present in the project (when reflecting) and the effects thereof
		3	Intensity (frequency) of changes in design choices	The amount of times choices in the design are changed and the effect thereof
		4	Risk acceptance	The degree to which actors accept risks and the effects thereof
		5	Balance in risk distribution	When a reference is made to the balance of risks the different actors are responsible for, and the effect thereof on the project

B	Commitment	6	Trust	When a reference is made to the level of trust and motivation that is present among all different project members and organizations and the effect that this has on the project
		7	Openness	The degree to which actors share information and are transparent towards each other and the effects thereof
		8	Level of kept promises and agreements	When a reference is made to promises or agreements and to what degree they are kept and the effect that this has on the project
		9	Commitment	The degree to which actors put effort or resources into the project and the effects thereof
		10	Urgency to succeed	The perceived necessity of making the project a success and the effects thereof
		11	Desire to succeed	The wish to make the project a success and the effects thereof
		12	Financial investments	When a reference is made to the amount of money (to be) spent on the project
		13	Required effort	The amount of effort that actors should spent on the project in order to make it a success and the effects thereof
		14	Difficulty to take the go/no go decision	The difficulty to decide whether to continue with the project or not
C	Time	15	Process time	The amount of time spent on the project and the effects thereof
		16	Time pressure	When a reference is made to the time available in the project, the time it costs to achieve certain objectives or ambitions and the effect thereof
		17	Perceived intensity of activities	The perceived amount of work actors have to do in order to make the project a success and the effects thereof
		18	Response time / speed of decision-making processes	The time it takes to provide a response to one another, the decision-making process that precedes this and the effects thereof
		19	Clarity of deadlines	The degree to which planned dates are comprehensible and clearly communicated to the project members, and the effects thereof
		20	Consequences of postponing deadlines	The effects that postponement of a deadline has on the project outcome and the effects thereof
		21	Presence of mandate	The degree to which the right people to decide are present at meetings or other moments of decision making and the effects thereof
		22	Decisiveness	The degree to which team members can take decisions at a certain moment in time and the effects thereof
		23	Alignment in speed of decision-making process	The level of correspondence between decision-making processes of different involved organizations and the effects thereof
		24	Flexibility of deadlines	The degree to which deadlines can be changed and the effects thereof
D	Information	25	Information gap	The amount of missing information and the effect thereof. This is the difference between the required and actual information level
		26	Required information	The amount of information necessary to make decisions and the effects thereof
		27	Available information	The amount of information available to the project members to make decisions and the effects thereof
		28	Feasibility of alternatives	The degree to which alternative solutions or design options are possible to realize within the given boundaries of the project, and the effects thereof
		29	Amount of thought out alternatives	The number of alternatives that are elaborated to a certain degree in that they still can be applied, and the effects thereof
		30	Level of detail in contracts	When a reference is made to the effect that a certain level of detail in the contract has on the project
		31	Concreteness of the question	The level of detail in elaboration and explanation of a question that one asks to another actor, and the effects thereof
		32	Concreteness of response	The level of detail in elaboration and explanation of an answer that one gives to another actor, and the effects thereof
		33	Concreteness and elaboration of solution A	The level of detail in elaboration and explanation of the base solution of the project, and the effects thereof

		34	Level of overview and control over the project	The degree to which actors know what is happening and can steer this, and the effects thereof
		35	Appropriateness of communication	The degree to which communication fits the situation or context, and the effects thereof
E	Goals and productivity	36	Level of reached goals or deadlines	When a reference is made to reaching goals or meet deadlines in the project and the effect thereof
		37	Shared interests	The degree to which individual or organizational objectives of the involved actors are similar and that they work towards the same outcome, and the effects thereof
		38	Balance between ambitions and boundaries	The degree to which the ambitions for the project match with the boundaries of the project, and the effects thereof
F	Knowledge and experience	39	Knowledge and experience	When a reference is made to the level of knowledge and experience that different actors in the project possess and the effect that this has on the project
		40	Ability to cope with uncertainties	The degree to which actors can act properly upon uncertainties and the effects thereof
G	Quality	41	Quality of work	When a reference is made to the degree to which the project outcome fulfills project ambitions and objectives, thus what is the quality of finished work
		42	Value level of the designed solution	The amount of value that the solution that is aimed at offers to the actors, and the effects thereof
		43	Quality of decision making	The degree to which the decision-making process is efficient and effective regarding the set project goals and ambitions, and the effects thereof
		44	Quality of decisions	The degree to which a decision supports the set project goals and ambitions, and the effects thereof

4.2.3 Validation of the causal loop diagram

To ascertain the quality of the study, it must be controllable, reliable and valid (Van Aken et al., 2007). For the controllability, at first a research proposal was written and later complemented to this description of the applied method. This creates the opportunity to replicate or judge the used approach. The method description furthermore contributes to the reliability, as if described correctly, other researchers should come to the same results when following the same approach (Yin, 2014). However, four potential biases are distinguished by Van Aken et al. (2007). To prevent these biases to occur, certain actions are executed. At first, the results are discussed with both company and university supervisors to prevent from researcher biases. Second, an interview protocol is discussed with supervisors and used during the interviews. Third, multiple data sources are used (i.e., project documents at different hierarchical levels and interviews). Fourth, interviewees are selected based upon their background in a variety of hierarchical levels, varying intensity of involvement in the project, covering the whole duration of the project, and working for all involved companies. Besides, from all perspectives on the negotiation, more than two actors are interviewed, with a total of nine interviewees. Fifth is the comparison of the results with literature and an expert reflection session with two more interviewees.

Validity can be divided into three types; construct validity, internal validity and external validity (Yin, 2014). For construct validity, the use of multiple sources of evidence is recommended (Yin, 2014), which is applied by means of document analysis, combined with interviews and an expert reflection session on the resulting CLD. The internal validity is high when the actual causes of the problem from the case study are found. External validity refers to the extent to which results can be generalized. For both internal and external validity an expert discussion was held, with experts from practice. During these discussions, both the correctness of the CLD for the specific case was discussed, as both experts were, although from some distance, involved in the project and thus could critically reflect on it. Furthermore, as the experts possess a vast amount of experience in similar projects where innovations

are (tried to) implement in large-scale, multi-dimensional and a collaborative context, they were also able to reflect on the external validity of the CLD. The model was set up generic, so contextual factors influencing the analyzed case are left out.

5. Results

In this section the results from the extensive document analysis, interviews and expert group discussion are presented. It is structured according to the data collection and analysis steps as described in chapter 4. Method. Thus, starting with a general case narrative, followed by the interview analysis and construction of a CLD, and ended with a discussion of the expert validation session.

5.1 General case narrative

The first interview served to establish a general case narrative. Resulting from the interview was a first sketch of a timeline indicating what important dates were, during the process of implementing the Smart Thermal Grid (STG). After the interview, the timeline was complemented using project documentation (e.g., the signed development agreement and e-mail contact among project members). The complemented timeline provided insights in certain distinct phases during the project. These phases are based upon deliverables at certain moments in time, such as a signed development agreement, combined with certain goals and deadlines that were set. The four main phases are listed below and visualized in Figure 10.

- 1) From the tender application until the signed development agreement between the consortium (DevelopCO, DesignCO, Witteveen+Bos) and the Municipality. This phase ranges from April 2018 until 20th of December 2018 (8 months).
- 2) Second, the period after signing the development agreement until the moment that the consortium and Heat supplier, the party for heat supply, signed the 'Letter of Intent' (LOI), or in Dutch 'Intentieovereenkomst' (IOVK). This period ranges from the 20th of December 2018 until the 12th of March 2019 (2,5 months).
- 3) The period after the 'Letter of Intent' until the signing the collaboration agreement and suspending it two weeks after. This comprises a period from 12-3-19 until signing at 15-10-19 and decomposing at the 1st of November 2019 (7,5 months).
- 4) The period after suspending the collaboration agreement where a new tender procedure was started, until April 2020 (5 months).

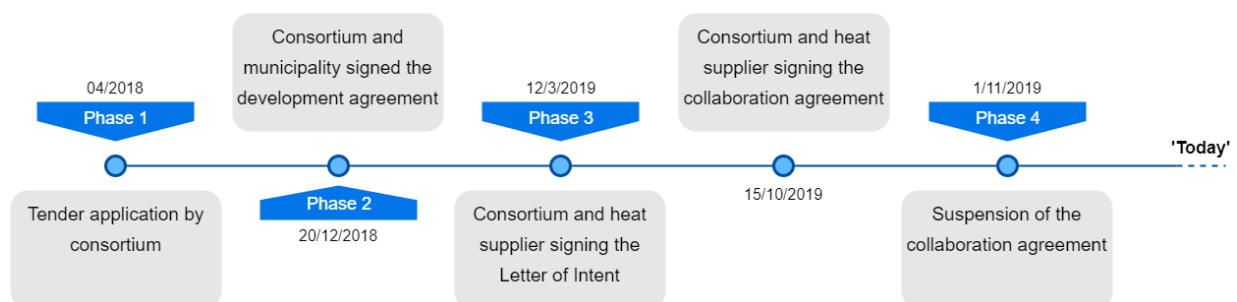


Figure 10: Phases in the process (own illustration)

Agreements were signed or suspended at certain dates. These dates form the boundaries of the phases. During the phases, the followed course of action is reaching a certain type of agreement (e.g., the Letter of Intent or the collaboration agreement). The type of agreement indicates on what level of detail elaborations of the implementation of the innovation should be. For instance, in the Letter of Intent serves to indicate the commitment and trust of the actors regarding the collective goal of reaching a collaboration agreement and thus collaborate in this project. Therefore, in this agreement, the technical specifications of the STG do not yet have to be as thoroughly described as they should be in the collaboration agreement. A more extended version of the timeline in which multiple interim deadlines and events are represented, can be found in .

5.1.1 Project documentation: Minutes of meetings

The analysis of the first group of data, the agenda and minutes of approximately 660 meetings, provides insights in the topics of discussion regarding STG. As visualized in Figure 11, most often the business case and financial elements of the innovation are discussed. Second and third are respectively the categories ‘temporal structures and assumptions’ (e.g., deadlines, time pressure), and ‘organization, collaboration and contracting’. Followed by the less frequently discussed spatial feasibility, ambitions and goals and technical feasibility. Additionally, in order to complement the case narrative, differences between hierarchical levels and changes within time (i.e., the various phases of the project), are evaluated. First part of this section comprises the analysis per level and the second part concerns the changes in time.

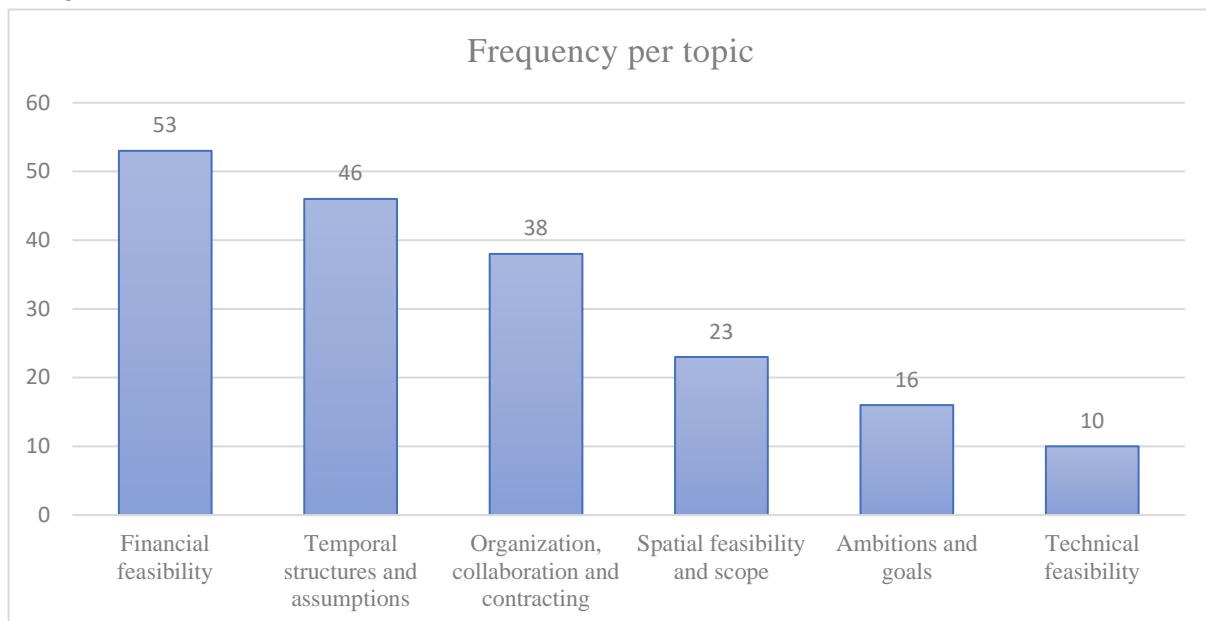


Figure 11: Frequency of discussion of the topics regarding the heating innovation

Analysis per hierarchical level

Firstly, insights are provided regarding the differences in what subjects were discussed and decision were taken on the different hierarchical levels present in the project. Using Figure 9 from section 4.2.1, three hierarchical levels are distinguished; that of the board and councilor, the project directors, and the project leaders. Two distinct meetings on project directors’ level are held (i.e., core group and core team consultation). In one of those meetings, the core team meeting, Partnership, Municipality and ExpoCO are attending. At the core group meeting only Partnership is attending. For that reason, the minutes of those meetings were analyzed separately.

Starting at the top of the hierarchy; the board and councilor, only in one meeting minutes the topic STG was discussed. In these minutes, spatial feasibility (i.e., adaptation of the innovation by the users) and a temporal structure (i.e., speed of technological developments, asking for an adaptive attitude) are discussed once, and ambitions and goals for the project (i.e., lowest possible CO2 emission and flexibility regarding real estate) are discussed two times. Explanation for the lack of discussion of the STG on this level, is found in the task of this hierarchical level, which is constructing project vision and goals. Therefore, this group operates on a larger scale than that of the specific heating solution. The STG is how substance is given to the vision and goals they established.

Second hierarchical level, that of project directors/managers, discusses most frequently temporal structures and assumptions regarding the STG (42%), followed closely by the organization, collaboration and contracting (30%) that are accompanied with the STG. Middle segment consists of financial feasibility (14%) and spatial feasibility and scope (8%), followed by ambitions and goals for the project (3%), and technical feasibility (3%). The results are visualized in Figure 12.

It appears that in these meetings mostly time aspects and the topic ‘organization, collaboration and contracting’ (i.e., management), are considered. The results suggest that this level has a strategic decision-making function (i.e., what are the project vision and goals and what strategy fits those?). The topic ambitions and goals of the project is represented only little. This might suggest that the STG is not contributing a lot to project ambitions and goals, or that it is not a project objective on itself to realize it. It can as well indicate that regarding the STG, the actors lost their focus on the ambitions and goals they had set. However, the small frequency can also be caused by that the STG on itself is already the chosen solution, so no discussion of what solution for heating and cooling fits goals and ambitions best is required anymore.

The hierarchical level of project leaders exists of two groups. The first group, consisting of the core team meeting, mostly (31%) discusses the financial feasibility of the STG. There other discussion frequency is spread out. From least discussed the ambitions and goals of the project (10%), to the technical feasibility (12%), the organization, collaboration and contracting (15%), the temporal structures and assumptions (16%) and the spatial feasibility and scope (16%). The results are visualized in Figure 12.

On the core team management level, attended by the clients and contractor, the clear variation of topics coming forward, indicate an informative function of this meeting (i.e., feedback from the contractor to the client regarding progress). Furthermore, it suggests that this group has a more tactical decision-making role (i.e., how can the vision and goals be achieved?). This corresponds to the structure of the meeting, in which both client and contractor are present and discuss what should be done in which way, without delving too deep into specific technical features of a solution.

Second group comprises the core group meeting minutes. These most frequently discusses the financial feasibility (31%) of the STG, followed by the temporal structures and assumptions (26%) and the organization, collaboration and contracting (24%). The set ambitions and goals (7%), technical feasibility (7%), and spatial feasibility and scope (5%) are represent less frequently. The results are visualized in Figure 12.

The third group, the Partnership core group meeting, focuses most on financial, temporal and managerial aspects. This suggest that their main interests for the project are in these aspects. Furthermore, the much lower presence in their conversations of the topic spatial feasibility and scope of the project is interesting, as it suggests a different focus of Partnership than what they discuss with their client (i.e., ExpoCO and Municipality).

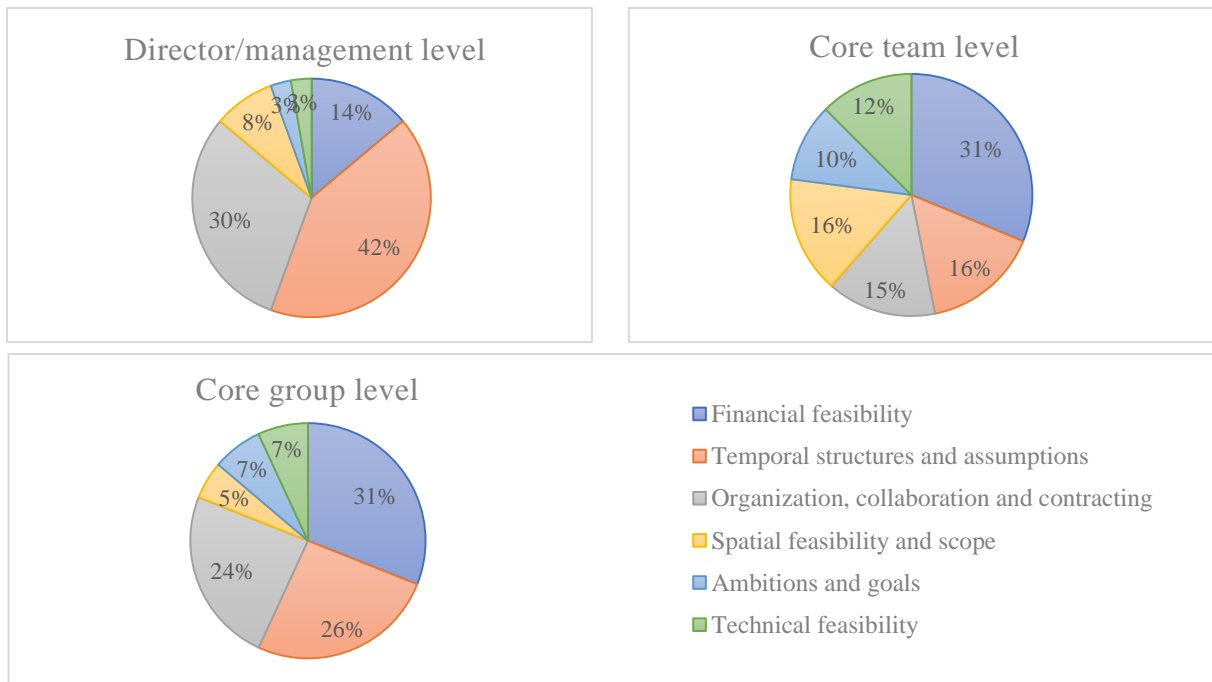


Figure 12: Frequency of topics discussed in director/management, core team and core group level meetings

Analysis of differences in time

In addition to the frequencies of topics discussed in the different meetings, changes within time/phases of the project are analyzed. The four phases as indicated in the beginning of this section are used for this analysis. The results are visualized in Figure 13. It indicates per phase what the differences of focus are. As the phases differ in length (i.e., phase one covers 8 months; phase two 2,5 months; phase three 7,5 months; and phase four 5 months), and thus a different number of meetings has taken place per phase, the variation between phases cannot be compared. However, interesting finding is the sudden increase during phase three in the focus on organizing, collaborating and contracting, and on the temporal aspects. Furthermore, there is an increased discussion of ambitions and goals in the third phase, whilst this category has at all other phases the lowest frequency. In the first and last phase of the project the financial aspects are by far most frequently discussed.

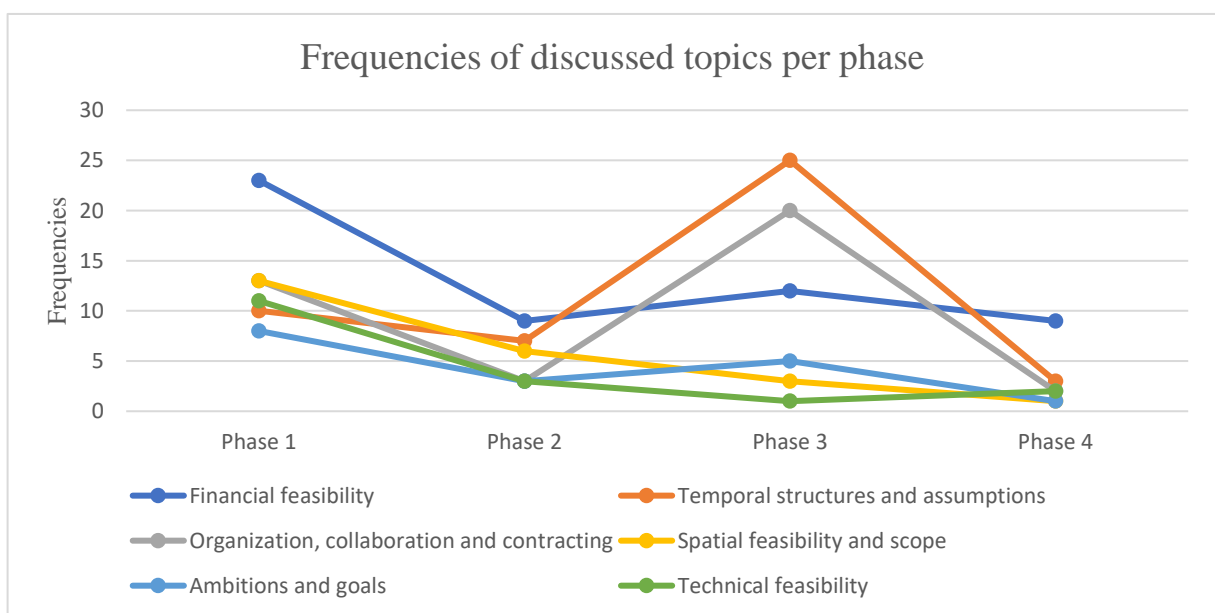


Figure 13: Frequencies of the discussed topics in the meeting minutes per phase

5.1.2 Project documentation: Emails, reports and other project team communication

The second group of data comprises all documented communication (i.e., emails and minutes) and reports (i.e., notes, advisory reports, project plans) on the ‘project staff members’ scale (Figure 9, section 4.2.1). The results of the analysis of this data per phase, as described in the beginning of this section, are discussed here.

The analysis of the first phase, the period from the tender offer until the signed development agreement, is combined with that of the second phase, comprising the period from the signed development agreement to the signed letter of intent. Reason is the little presence of the STG subject already in the first phase of the project, as during that period the client and contractor (i.e., Partnership and Municipality) were working on the final development agreement still. However, there has been some activity regarding the STG already in that phase, due to which this phase is combined with the second phase. The results in Figure 14 show that the main focus during these phases was on financial feasibility, organization, collaboration and contracting, and time aspects. Less represented are the technical feasibility, the ambitions and goals, and the spatial feasibility.

The third phase comprises the period from signing the letter of intent until the suspension of the signed collaboration agreement. From the results in Figure 14 it becomes clear that the third phase is a contract negotiation phase. After the actors had signed the Letter of Intent, they worked towards a collaboration agreement during phase three. The ambitions and goals of the project and the spatial feasibility were driven towards the back of the focus. The technical feasibility and time aspects received a similar focus as they did in the first two phases.

The described frequencies of topics discussed at all levels and phases, provided better understanding of the case for the researcher and a first general overview of the processes that occurred. In the next section, the uncovered dynamics of the project are explained.

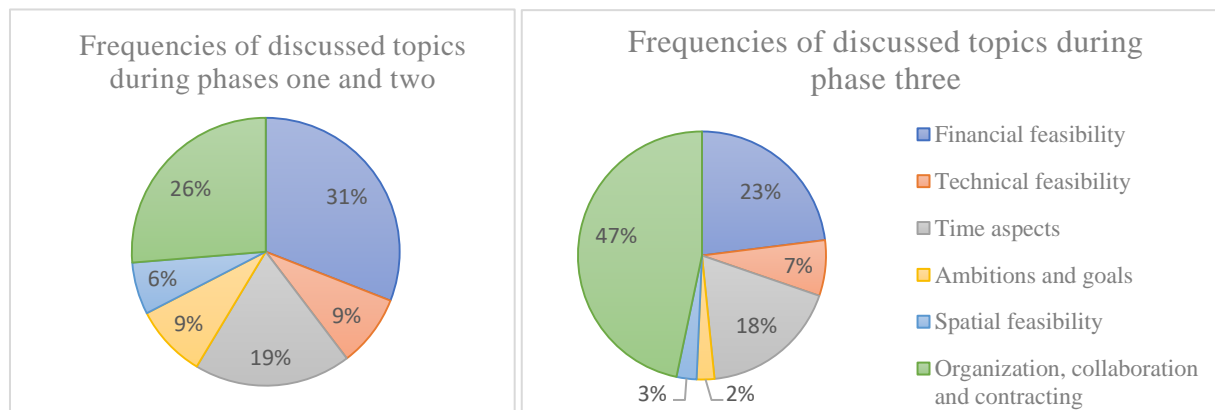


Figure 14: Frequencies of the discussed topics during the first and second (left) and third (right) phase of the project

5.2 Interviews and Causal Loop Diagram

The Smart Thermal Grid (STG) was one of the innovations in the innovation dossier. This innovation dossier was an important element of the tender offer that the consortium (i.e., DevelopCO, Witteveen+Bos and DesignCO) made to the Municipality, who had set out the tender. In the offer the consortium proposed to investigate the feasibility of implementing the innovations from the dossier. In the full timeline can be found, showing the process of the project from beginning until the end. In Appendix D the list of interviewees can be found, in the graphs drawn by the interviewees during the interviews, and in tables of all mentioned cause-and-effect relations and their mechanisms. In this section the gist of this data and the analysis thereof is discussed.

The consortium made their offer to the Municipality at the end of April 2018. One month later, they received a provisional award for the tender from the Municipality. Already from this early phase in where there was no signed development agreement yet, they started searching for an extra party that they could collaborate with to design, build, operate and maintain the heating and cooling supply of the area. Due to a concession that was provided by the Municipality towards Heat supplier (nowadays Heat supplier) already before the start of this project, Heat supplier was the first party that the consortium got in contact with. This concession meant that Heat supplier had the rights, but also the duty, to supply heat for the area. However, in the beginning of August 2018, Heat supplier and the Municipality both agreed to the acquittance of this concession. Despite the acquittance of the concession, due to political pressure and from a time-saving perspective, it was decided to collaborate with Heat supplier anyway, aiming at the realization of a STG. The alternative was to set out a tender procedure, which would have costed time and time was scarce during the project. Furthermore, Heat supplier was potential sponsor of the Expo, which caused some political pressure from the ExpoCO and the Municipality to make the collaboration work. Another factor causing political pressure is the political system itself. The councilor of the municipality made promises regarding the project to the rest of the councilors which did or did not get realized. Besides, there was a political debate about the project on itself, as a substantial group of inhabitants and political parties within the municipality did not agree with it at all. These contextual factors affected the process to some extent, however, due to that the objective of the study is to obtain more general insights in the dynamics of negation projects in the given context, these factors are not further discussed in this study.

Another important contextual factor during this first phase of the project was the collaboration between DevelopCO and BuildCO. DevelopCO is a real estate development company, thus is lacking construction capabilities, whilst this was required for the project. Therefore, they decided to find a collaboration partner that could complement the capabilities. In the period from May 2018 to January 2019, DevelopCO and BuildCO established Partnership, which would eventually be the contractor of the project. In chapter 3. Method, a more extensive elaboration on the organization of the project is provided. At the 20th of December 2018, DevelopCO, then still on its own, and the Municipality signed the development agreement. After the establishment of Partnership in 2019, the contracting party changed from just DevelopCO to Partnership, thus, the combination of BuildCO and DevelopCO. For Heat supplier, their negotiation partner changed due to this change in contracting party, which affected the process as an exogenous factor as well. New people were involved in the negotiations, and previous work got all checked by the new party. Heat supplier perceived this ‘rework’ as a lack of trust in their capabilities, as one of the interviewees indicate in the quote below. Trust appeared to be an important element in the negotiation process, which will be further elaborated in the following paragraphs.

P4: “We had a plan, then BuildCO got involved and suddenly added an external consultant to the project team. This consultant started to analyze everything from the very beginning, whether the STG was the best option, whether we were the best party, etc. So, we had to sell the project, that we had already sold earlier, again, to Consultant 2, which was very annoying and did not do well to trust.” (P4, 2020)

5.2.1 Episode 1

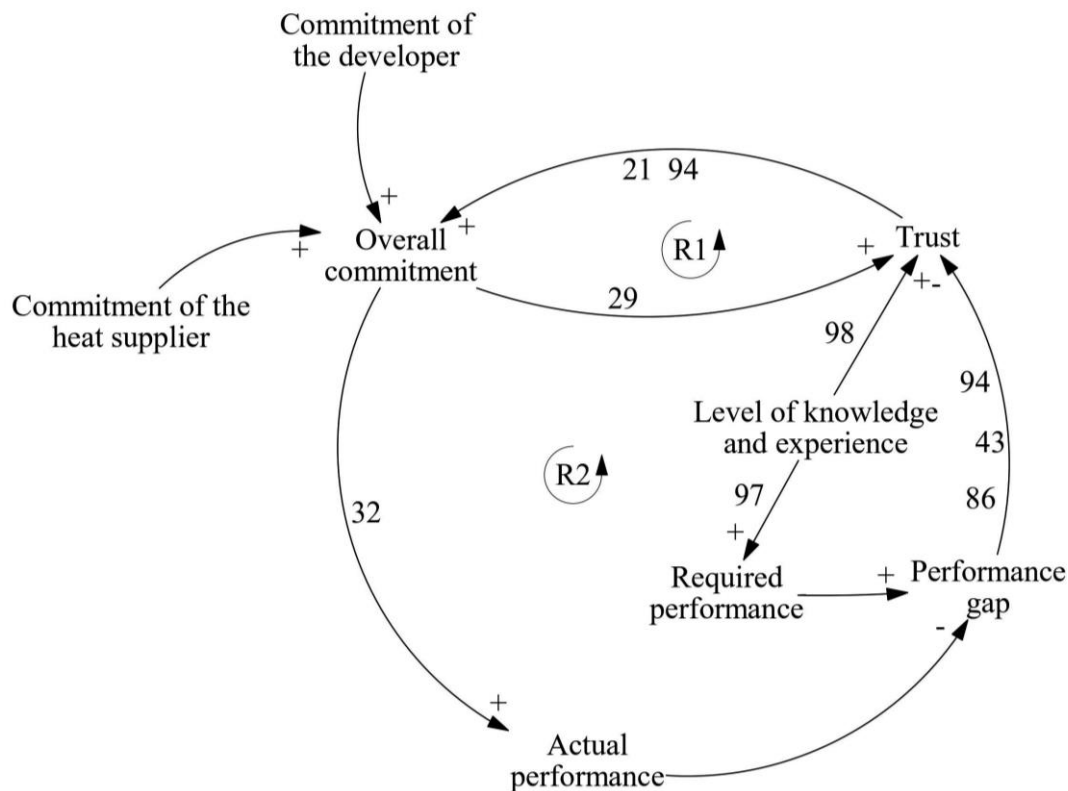


Figure 15: Loop 1. Variables are related by causal links, which are shown as numbered arrows. Each causal link is assigned a polarity: either positive ("+") or negative ("-"). A positive link means that if the cause increases (decreases), then also the effect increases (decreases). A negative link means that if the cause increases (decreases), then the effect decreases (increases). The 'B' and 'R' labels denote the nature of the feedback loop: Balancing and Reinforcing respectively. See Sterman (2000).

The goal of the first episode is establishment and signing a Letter of Intent between Heat supplier and the consortium (later Partnership), to reach a collaboration agreement. At the start of the anticipated collaboration between those two parties, both actors had a certain commitment to the project. Naturally, both wanted the implementation of the STG to succeed, so commitment was high. However, the focus of the consortium (later Partnership) during this first period was mainly on the development agreement between them and the Municipality. Besides, all other aspects of the urban area development project asked for attention as well. Heat supplier, however, had a full focus on the STG during the first phase. This was partly due to the time pressure that was communicated to them by the consortium, but also due to that they wanted to be the chosen party to realize the STG for their own company interests. Reason for this communicated time pressure by the consortium toward Heat supplier was the aim of the consortium to incorporate the offer of Heat supplier into their development plan, which they had to communicate to the Municipality before December 2018.

Furthermore, both actors strongly rely on the commitment and energy of each other, as they have to reach an agreement in cooperation with input from both sides. Next to reliance on each other, both actors separately also depend on commitment and energy of other parties. Namely, Partnership requires commitment from their contractor; the Municipality, which in turn has an agreement with the ExpoCO Heat supplier relies on the input from their consultant and on internal commitment. This latter will be discussed more in detail in episode 2, as it starts to affect the process more during that phase. This reliability reflects **insight 1d** from the literature review in the second chapter; **'The level of reliability on commitment and energy of others'** being a key factor for successful implementation of innovations

in the context of sustainability transitions. According to Kotter and Schlesinger (1979; as in Hayes, 2002), high reliability on commitment and energy of others to make the change plan work, increases the necessity of adopting a collaborative approach and involve others in the change process. In the analyzed case, reliability is high and initially the commitment both actors have to the collaboration is too. During the first episode, reliability extended and the necessity of adopting a collaborative approach increased accordingly. This need for a collaborative approach was recognized by the involved parties and incorporated into the deliverable of this stage; the letter of intent. It forms an agreement in order to conduct exclusively and jointly a study in order to reach a collaboration agreement. The levels of commitment of both actors at the start of the project forms the first important condition for this episode.

Another important aspect influencing the collaboration process between the two parties was the level of knowledge and experience regarding the implementation of an STG both had at the start of the project. Both actors had no experience in realizing a concept such as the STG. Considering that this study is about the implementation of an innovation, this lack of experience is typical for these cases. However, it caused some difficulties during the process. At first, the low level of knowledge and experience of the actors at the start of the project made the required performance increase. For instance, it took more time to create model contracts for the future customers, or to find out how to design the system and make it work properly. Thus, more performance from both actors is required in order to reach the project objectives (i.e., a letter of intent during this first episode). Besides, the level of knowledge and experience affects the communication between the parties; an increased level of knowledge is a better base for communication, consequently affecting the required performance. This effect gets stronger in later phases where more (technical) depth is required, as another objective is aimed at, and will be discussed in more detail in the narrative about the second episode.

The low level of knowledge and experience involved actors had during the first episode did not affect the performance during the first stage via **'availability of required data to the involved actors'**, which is one of the key factors for successful implementation (i.e., **insight 1b**) as described in literature. Reason for this lacking effect can be found in the required knowledge level for reaching the objective of the first stage (i.e., constructing and signing a letter of intent). Actors had the required level of knowledge during this first stage, due to which required data was available to the actors. In turn, this led to successful completion of the stage's objective.

Secondly, the low knowledge and experience level regarding the implementation of an STG reduced the level of trust among actors. When an actor has more knowledge and experience, the use of the capabilities accompanied with it, generates trust among all actors. Furthermore, when both actors have a certain level of knowledge and experience, they can more easily communicate, which also improves the perceived trust among them. This also works the other way around. As one of the project team members from Heat supplier reflects;

P4: "Well, I have the feeling that Witteveen+Bos worked on such a heating network for one of the first times and had relatively little knowledge about how such a business case is established. [...] This had costed pretty much time in the beginning [...] But we have to take a good look at ourselves too, because for Heat supplier it was a nascent business unit who was working on this as well, which as well wasn't helpful."

Another involved actor, an extern consultant working for the consortium, also mentions this regard during an interview;

P9: “These are other type of contracts, as it involves supply of heat and cold from a smart thermal grid, with which they [Heat supplier] did have relatively little experience. All contracts had to be made still, whilst one expected them to have multiple standards and 80 percent was already thought out, so that we had to discuss only the last 20 percent. Well, that costed a lot of time and effort.”

Another interviewee indicates the influence that the level of knowledge and experience among actors has on trust as follows;

Interviewer: “Are there other aspects influencing trust?” P2: “Yes, how somebody presents him or herself in general, which consists on one side of knowledge, does somebody has head for business, but also whether somebody has the capabilities to act upon it.”

Trust appeared to be an important factor in the negotiation process in the case during the first episode. This corresponds to what is stated in **insight 1c**, where **‘the degree to which stakeholders trust each other’** is the third key factor for successful implementation of innovations in the context of sustainability transitions.

Being aware of these conditions at the start of the collaboration between Heat supplier and the consortium/Partnership, the first loop of the model (Figure 15) can be further elaborated. The commitment levels of both actors together form the overall commitment to the project. Thus, more focus and commitment of the actors separately, means more overall commitment to the project. The general level of commitment influenced the productivity of the involved actors, as more time, effort and money were spent on the project. Thus, as the overall commitment in the first stage of the project increased, the actual performance increased as well. As indicated by one of the interviewees;

Interviewer: “So there was a great desire to make it succeed?” P9: “Absolutely”

Although the required level of performance increased somewhat due to the low level of knowledge and experience regarding implementing the STG, still the performance gap was decreasing during the first episode of the project and eventually the Letter of Intent was signed. Result of a decrease in performance gap was an increasing trust level during the first episode. This relation is exemplified by the following quotes from the interviews.

P1: “The trust level was average at the start and then stayed stable... Or maybe it even increased when we approached the Letter of Intent, like ‘hey, we are really going somewhere’.”

Interviewer: “So then you achieve something? P2: “Yes and those met intermediate deadlines provide trust in that we can come to a business case and they boost the collaboration within the working group.”

Thus, when the team was approaching their goal in the first episode; signing the Letter of Intent, the trust level was increasing. This caused an increase in commitment at that time as well. As one of the interviewees outlines, the commitment level follows the level of trust. The following quote indicates this. In graphs visualizing these developments over time can be found, drew by the interviewees.

*P4: “The general commitment Heat supplier has to the goal of the Expo, developing the smart thermal grid, did have this course *Draws graph*. It follows the trust level, which is only logical I think.”*

This effect of trust on commitment is outlined by Hayes (2002, p.164) as well; *“The more the other stakeholders trust the change managers the more likely they are to be prepared to follow their direction. The lower the level of trust the more the change managers may have to involve others in order to win their trust and build their commitment to the change plan”*. This relations underlies **insight 1c** regarding trust among stakeholders being key factor for successful implementation of innovations.

To continue the analysis of the process of the case, the level of trust thus influences the commitment. When there is more trust in each other, commitment to the collaboration increases, as the expectations of both actors concerning the successful fulfilment of the stage objective, and eventually project objective, are increasingly positive. Result from this increase in commitment is an increase in trust, as it ‘proves’ good intentions of the negotiation partner. This reinforcing loop is denoted by R1 in Figure 15. In all, this process follows a reinforcing loop, denoted by R2 in Figure 15, it strengthens its own effect every loop. The first episode thus follows a self-constructive loop, which leads to positive results of the project as a positive course was found.

Other insight from literature was the importance of **‘the urgency and stakes involved in the change process’ (insight 1a)** for successful implementation of innovations in the context of sustainability transitions. Urgency is by Hayes (2002) referred to as the size of the short-run risks for an organization if nothing is changed to the current situation. If the change is urgent, so short-run risks are high, there might not be time for involvement and participation, which generally takes time. The analyzed process is exposed to time pressure; however, this still regards a multiyear process, which does not make the urgency at such high level on the short-term that there is no time for involvement and participation. Therefore, the aimed collaborative approach, instead of a more directive approach, suits the urgency level.

5.2.2 Episode 2: The start

The second episode started after signing the Letter of Intent. By signing it, thus performing as planned, the trust and commitment levels among actors increased. Therefore, the actual performance was increasing at the start of episode 2 as well. However, during this second episode, the importance of the level of knowledge and experience of actors increased. As for both actors (i.e., Heat supplier and Partnership) this level was low at this time, the required performance increased. Thus, even whilst actual performance was still increasing at that time, the performance gap increased. Reason for the increased required knowledge was the goal of this episode; reaching a collaboration agreement for the STG. This caused a difference in required knowledge, as more details are included in a collaboration agreement than there are in a letter of intent. The latter consists of agreed ambitions and goals, planning and deadlines of the process of reaching a collaboration agreement, requirements for the content of the collaboration agreement and assumptions for the scope of the project. The collaboration agreement, however, consists of the answer to the plan of the Letter of Intent. Furthermore, it comprises elaboration of organizational and technical aspects, such as the model contracts to communicate to future consumers of the grid. In order to come to an agreement on those elements, certain knowledge is required, which was not available at the start of episode 2. According to the model as explained in episode 1, the increased performance gap causes a decrease in trust, which is also outlined by various interviewees.

P1: “Those agreements just did not happen, so we had quite a lot of questions about whether or not we still trusted this. Do we still dare to do this?”

P4: “Then it’s fine to spend those tons, fine, we are going to do the project.”

Interviewer: “Yes, so than you expect to start executing next month, so to speak?”. P4:

“Yes, so to speak, because eventually it was not the case.” Interviewer: “Which was a damper all the time because those deadlines weren’t met?” P4: “Yes, this project is the most horrible project that I have ever worked on during my career.”

P9: “So you see the postponement [of the deadlines] all the time and because of that it gets less credible towards each other.”

From these quotes, it can be concluded that a form of reciprocity was missing during this phase of the project. As P4 indicates, they expected reciprocity regarding commitment (i.e., an assurance that the actors will execute the project together) from their negotiation partner, which got postponed multiple times, leading to lower trust and consequently lower commitment (e.g., Pieperhoff, 2018; Van Lange et al., 2013). In turn, the actual performance of the negotiation process, which is denoted in terms of agreement among actors, working towards the objective of constructing and signing a collaboration agreement, started to decrease as well. Another aspect strengthening this effect is the increased importance of trust when the uncertainty level of the project is high (Van Lange et al., 2013). In a social dilemma experiment by Tazelaar et al. (2004) it was shown that the negative effects of uncertainty were stronger when there was low trust among people and weaker when trust levels were high. Moreover, the effect of trust increases when outcomes of both parties are strongly conflicting (Van Lange et al., 2013), as these situations involve the greatest degree of vulnerability. This is, due to that trusting others in these situations to act in the collective’s interest can be costly. In all, it can be stated that trust is about accepting vulnerability based upon expectations regarding the behavior or intentions of the opposing party (Van Lange et al., 2013; Evans and Krueger, 2010). The described negotiation process follows a reinforcing loop, as it strengthens its own effect. However, this loop has some side effects, visualized in (larger sized version in Appendix H) and described in section 5.2.4. First, the description of the analysis of the gathered data follows (section 5.2.3).

5.2.3 Data analysis and construction of the CLD

The selected cause-and-effect relations from the interviews are shown in Table 5. The full version of this table, divided into seven separate tables by their category, can be found in (). A selection of the full table is made based upon the amount of times a relation is mentioned during the interviews (> 2 times). However, some exceptions exist. At first, the effect of trust influencing openness (no. 20) is mentioned only one time during the interviews. Reason that this effect is incorporated in the model is the confirmation of the existence and importance of the effect during the expert validation session (for the full transcript, see). The same holds for no. 79, 82 and 83. Concerning relations 80 and 84, both interviewees describe the same process of an information level determining the level of perceived uncertainties, although using other names for it. For a full description of the mechanisms underlying the relations of Table 5, see in .

Table 5: Cause and effect relations from the interviews

No.	Cause	Effect	+/-	Count	Whom
4	Perceived uncertainties	Commitment	-	4	P1, P3, P5, P7
7	Perceived uncertainties	Quality of decision	-	2	P2, P5
19	Trust	Level of detail in contracts	-	4	P1, P5, P6, P9
20	Trust	Openness	+	1	P6
21	Trust	Commitment	+	2	P1, P6
26	Level of kept promises and agreements	Trust	+	3	P4, P7, P8
29	Commitment	Trust	+	2	P6, P9

37	Openness	Available information	+	2	P5, P6
43	Process time	Trust	-	2	P4, P6
52	Time pressure	Speed of decision-making processes	+	3	P3, P7, P8
53	Time pressure	Perceived uncertainties	+	2	P5, P7
54	Time pressure	Commitment	+	2	P2, P6
57	Time pressure	Quality of decisions	-	2	P4, P6
58	Speed of decision-making process	The level of reached goals or deadlines	-	2	P1, P9
71	Level of detail in contracts	Process time	+	4	P3, P4, P5, P6
79	Information gap	Quality of decisions	-	1	P5
80	Information gap	Perceived uncertainties	+	1	P5
82	Required information	Information gap	-	1	P5
83	Available information	Information gap	-	1	P5
84	Available information	Perceived uncertainties	-	1	P1
86	The level of reached goals or deadlines	Trust	+	3	P1, P4, P9
91	The level of reached goals or deadlines	Time pressure	-	2	P1, P3
94	The level of reached goals or deadlines	Commitment (via trust)	+	2	P2, P4
97	Level of knowledge and experience	Process time	-	3	P1, P6, P9
98	Level of knowledge and experience	Trust	+	4	P1, P2, P4, P6

To continue, some effects denoted in to , mentioned more than two times, are not incorporated in the model¹. For instance, relation no. 8, indicating the effect of the level of perceived uncertainties on the decisiveness. This effect seems present in the case, but the effects of decisiveness on other variables are less frequently mentioned. Relations 65 to 69 suggest some effects of decisiveness on the project, of which most are mentioned just by one interviewee (P2). Therefore, it is decided to leave out the concept decisiveness, as its effects are not indicated by the interviewees as very impactful. Relation 64 also concern decisiveness and is left out. For the concept risk acceptance, a similar motivation was followed, as not enough effects influencing the level of risk acceptance of involved actors are mentioned in the interviews. This concerns relation 12. The phrases suggesting the presence of relation 28, indicate that the commitment increased as a result of an increased level of kept promises and agreements, via an increased level of trust, thus combining relations 21 and 26, which are included in the CLD. The ‘desire to succeed’ influencing commitment (relation 34) was left out due to overlap of the definitions of the two terms. Relation 35 explaining that commitment is causing a difficulty in taking a ‘no go’ decision for the project, suggests occurrence of ‘Escalation of Commitment’ (e.g., Staw, 1981). At first, it seemed that this was an important failure factor for the process, however, at a later stage the effect of other aspects such as trust and uncertainties was found to be much more important in explaining the process. Furthermore, eventually the collaboration with the first heat supplier was ended, so commitment did eventually not prevent this decision from being taken. Next relationship which was denoted two times is an increase in openness causing an increase in trust (no. 36). This effect is however understood to occur via the information level, uncertainties and commitment to a project, as well as via information level, uncertainties, quality of decisions and performance, both eventually leading to indeed an increase in trust. Regarding relation 44 (i.e., increased (decreased) process time making the level of available information increasing (decreasing) too), deviated perceptions existed among the interviewees. Some argued the relation to be present (P1, P5), whilst others argued that the information level did not increase

¹ Due to the explanatory goal of this study, to which these relations are not contributing.

when time passed (P3, P4), which they indicated as being one of the main problems. Relations 51 and 56 describe opposite effects; on the one hand increased time pressure decreases performance, as not as much ambitions can be reached within the given time frame. On the other hand, it increases performance, as project members are increasing their productivity. However, to this latter there is a limit, where too much time pressure starts to decrease productivity ('Disaster Dynamics', Rudolph & Repenning, 2002). The described selection procedure led to the implementation of the causal relationships summed up in Table 5 into the CLD.

In the CLD in , the numbers next to the arrows denote the causal relations from Table 5. Relations 43, 71, and 87 from the table discuss 'process time', which is included in the CLD as part of actual performance. More process times indicates lower actual performance, as it costed actors more time to complete certain activities. Besides, the relations including the variable 'the level of reached goals or deadlines' (nos. 58, 86, 91 and 94) are also included as actual performance indicator, as more met deadlines and reached goals indicates a form of progress in the project. Last performance indicator is the 'level of kept promises and agreements' (relation no. 26), as the goal of each stage was to come to an agreement. The causal relations between 'perceived uncertainty' and 'level of detail in contracts', and 'collective experience' and 'required information', were added after the expert validation session, which will be discussed more thoroughly at the end of this section. In the following paragraphs the CLD is further elaborated.

5.2.4 Episode 2: Continued

As explained in the section 5.2.2 Episode 2: The start, the performance gap started to increase. A consequence thereof were increased schedule problems, which led to an increased time pressure. Reason for the schedule problems was that due to an increasing performance gap, more time is required to finish certain activities, because of which deadlines got postponed and slack reserved for the rest of the project was used for reaching the not yet met goals of the stage. The following quotes from interviewees mention this regard.

P1: "Because time pressure does in fact increase when longer is waited, planning-wise."

P2: "But then it is said 'oh well, there is some slack left in the planning after all', where one first thinks it is really not possible anymore, it appears that there is actually some space left because it is analyzed from a different perspective." Interviewer: "Does that lead to a decrease of the slack in the overall project or does it stay the same?" P2: "Yes, that slack decreases."

Interviewer: "Maybe we can draw the time pressure in a graph. For example, did it increase when the project progresses?" P3: "Well yes, you saw the decisions being postponed all the time." Interviewer: "Thus the time pressure increases?" P3: "Yes".

Van Oorschot, Akkermans, Sengupta and Van Wassenhove (2013) studied the process of complex new product development projects. In their study, they provided insights in the unintended side effects of gate slippage (i.e., stretching current project stages at the expense of future stages), by means of a CLD. One of the unintended effects was the increase in schedule problems for the overall project. Due to information filters, teams failed to notice what was happening until it was already too late. A similar process of gate slippage causing schedule problems occurred in the analyzed case. However, no indications of information filters blurring the perception of this time pressure, were found to be present. Project members were very aware of the schedule problems and increased time pressure, which became

clear from both the project documents (see sections 5.1.1 and 5.1.2) and the interviews. They just did not find a way out and thus just included the time pressure as extra perceived uncertainty.

In the following paragraphs, the causal loop diagram is further extended stepwise, according to consequences identified during the interview analysis.

Consequence 1a - time pressure and speed of decision making

The increased time pressure in the case during the second episode had several consequences. The first was an increased speed of decision-making processes (loop 'B1', Figure 16), as *"time pressure makes the involved actors understand that no time can be wasted on unnecessarily long decision-making processes"* (interview P8, 2020). Besides, as the perceived level of urgency grows among actors, people will work harder and spent more time to the project (interview P2, 2020). An example of increased speed of decision-making processes is when the required mandate for a decision was not present at a project team meeting in which they wanted to make this decision, the project team members called their directors directly after the meeting to let them decide and fed it back already the same day to the rest of project team. Reason that the person with the required mandate was not present at project team meetings is that this decision maker is oftentimes someone from director level, as it concerned large-impact decisions, and from not project member level. The process of immediately contacting the director level for a certain decision, instead of following a certain general process within a company, did accelerate the decision-making process strongly. This had a positive impact on the productivity of the team and thus, in turn, on the level of met deadlines and reached goals. As explained by one of the interviewees:

P8: "One could say that it is inevitable to go back to a higher decision level when decisions have to be made that are deviating from previously known issues, but when a project is on pressure, also time pressure, parties understand that all sorts of regular decision making procedures are swept away ruthlessly. One could say that the mechanism to think 'I have to go back to my directors', stays. On the other side, the mechanism within the party to think about it for three weeks, submit it in threefold, to have it passing this, this and this person and eventually after three weeks have it on the desk of the directors, that mechanism, falls."

Despite the positive effect at first, after some time this increase in alignment stopped. The reason why this alignment did not further increase, can be found in literature regarding temporal cognitions (Gevers et al., 2004). Temporal cognitions *"define a person's perspective on the appropriate timing and pacing of actions in the work place"* (Gevers et al., 2004, p.70). These cognitions are affected by the work environment, which *"expresses how time is to be perceived, evaluated, and spent by its members through cycles and rhythms of activities, sociotemporal norms, schedules, and deadlines"* (Gevers et al., 2004, p.69). The work environment can be the organization, department or project team. In the analyzed case, it comprises the project team consisting of people from multiple organizations (i.e., the Municipality, consultants, developing party and heat supplier). Due to the fact that the deduction from the work environment happens at individual level, variation of temporal cognition within the project team can occur. As in this case there are also multiple organizations represented in the project team, variation is very likely to occur. However, alignment in those cognitions, or shared temporal cognitions (STC; Gevers et al., 2004), would be beneficial for the performance of the project team. STC is argued to improve coordination of team members' actions (Gevers et al., 2004) and in turn performance of the project team. STC can be developed by means of goal setting, temporal reflexivity (Gevers et al., 2004), and temporal planning (Gevers et al., 2001).

During the expert discussion, temporal cognitions were touched upon as well. As one of the experts outlines: *“The decision that they apparently required did in no possible way fit within the time limits. So then it’s not even the speed of decision making or the decisiveness anymore, it just didn’t fit the scope.”* (E1, 2020). However, it costed a lot of time to understand that this could not be changed. Expectations were that the internal decision-making processes of the heat supplier could be adjusted somewhat to fit the project scope and time limits. As expert E1 continued: *“They mentioned it quite often at some moment in time, but we just didn’t believe that it could be true, it is such nonsense. However, after some time, finding a way to anyway get a definite yes or no appeared not to be possible.”*. Reason for the disbelief was, at first, also uncertainty from the project members working at the heat supplier company themselves, about whether they had to follow their standard internal decision making process or not. The standard process was organized by certain gate decisions (i.e., ‘toll gates’) where some specified deliverables were required in order to be allowed to continue (i.e., an object-orientation; see Reinecke and Ansari, 2015). Contrary, the developing party adopted a more process-oriented organization of their decision-making process (Reinecke and Ansari, 2015). This is visible in the ambition and goal formulation in the development agreement between them and the municipality. Namely, they constructed a list of innovation opportunities of which they were going to study the feasibility. For this reason, the project was in this aspect open-ended and the process of analyzing the possibilities was the focus instead of specified deliverables or requirements. As the contractor of the project is the developing party and the heat supplier is a subcontractor, the developing party, in consultation with the client (i.e., the municipality), determined the standard cognitions on time for the project.

Thus, both the temporal orientations and the temporal cognitions of involved actors were conflicting. However, the presence of these conflicts occurred more outside of the knowledge and awareness of project team members who were working on the collaboration contract, and played a role on director level mainly. As E1 elaborates: *“It was uncertain how things would go and the things that were said sounded so illogical, that we thought ‘well, that probably will be changed’. Eventually, it appeared that it wouldn’t be changed. This happened outside the room, so to say. Inside the room, we were still working to come to that collaboration agreement for a very long time, until the smallest details. Which as well, eventually, did not go well.”*. This quote from E1, whom is working for the developing party, indicates the difference in temporal cognitions between the two actors, as the temporal planning of the heat supplier is perceived illogical by the developing party. After some time, it became clear and understood that the heat supplier was not prepared or able to adjust their temporal planning to the project’s temporal planning. This lack in shared temporal cognitions was one of the main reasons for the failure of the negotiation process. Therefore, the results from this study confirm the effects STC has on performance of a project team found in literature, as stated in **Insight 9; ‘Shared temporal cognitions (STC) improve performance of a team and can be developed by means of goal setting, temporal planning and temporal reflexivity’**. The approaches of goal setting, temporal planning and temporal reflexivity are not clearly present in the analyzed process.

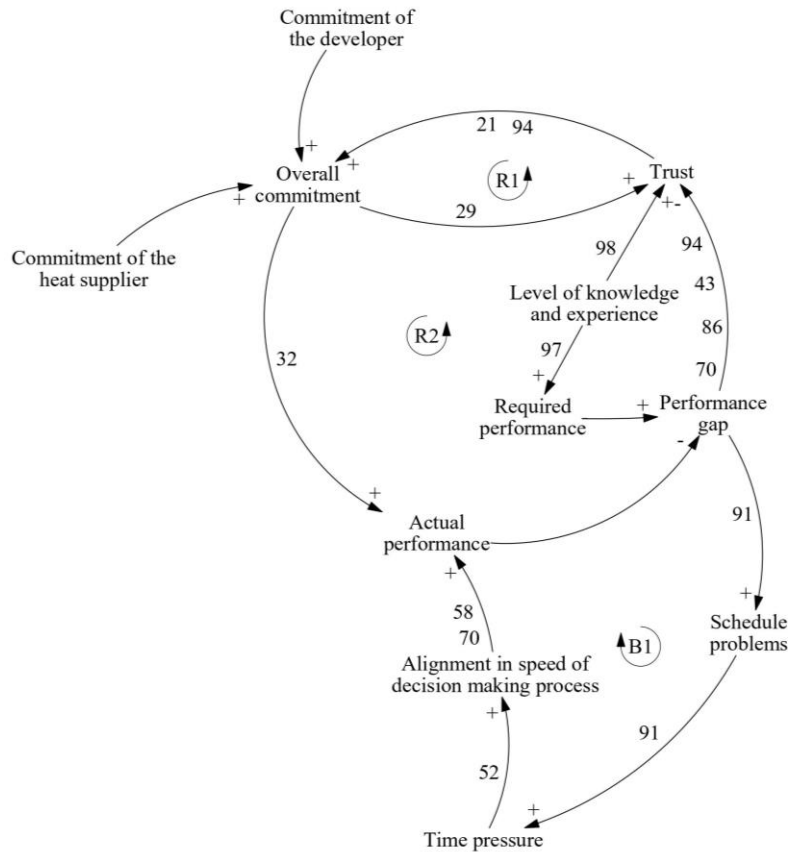


Figure 16: Consequence 1a, time pressure affecting alignment in speed of decision-making processes ('B1'). Variables are related by causal links, which are shown as numbered arrows. Each causal link is assigned a polarity: either positive ("+") or negative ("-"). A positive link means that if the cause increases (decreases), then also the effect increases (decreases). A negative link means that if the cause increases (decreases), then the effect decreases (increases). The 'B' and 'R' labels denote the nature of the feedback loop: Balancing and Reinforcing respectively. See Sterman (2000).

Consequence 1b - time pressure and perceived uncertainties

Second consequence of increased time pressure is an increased level of perceived uncertainties, as there is more risk in not finishing the project in time or not being able to reach a certain quality within the time frame. As noted by one of the interviewees, "Pressure on the quality arose, due to the time pressure" (P2, 2020).

Consequence 2a - perceived uncertainty and quality of decisions

The first effect of the increased uncertainties is a decrease in quality of decisions (loop 'R3', Figure 17). It is noticed in the degree to which people support the decisions and do not change them. Support was low and changes happened often, due to the uncertainties. Furthermore, qualitative decisions contribute in reaching the project objectives, which the made decisions in the project did not (e.g., decision to postpone a deadline or cancel parts of the project decreases performance). Therefore, the quality of the decisions has a positive causal relation with the actual performance of the project. These two effects are mentioned in the following quotes from the interviews.

P5: "In order to make decisions, I require more information than currently available, due to which my uncertainty about the decision starts to increase [...] Now we start working, we notice that the information gap increases, so actually the quality of the decision starts to decrease, but we continue anyway."

P6: “One really requires certain information and you don’t know at the start which information, so you will need a very open relation in which trust is the base in order to receive the best information from each other about what should be done. But still, it concerns innovation and progressive and there can occur situation about which you’ll say ‘oh, well, we did not see that coming’. However, before you get there, there are a lot of basics that should be discussed and if one’s counteracting another and behaves annoying, this is not happening. It won’t be a success then.”

De Dreu et al. (2008) indicate the effect of individual motives on information dissemination and integration, subsequently affecting the quality of group decisions. As explained in chapter 3 Theoretical background, this effect is influenced by the decision urgency and the member input indispensability. To what depth and with which bias information is shared and discussed within the group, depends on the social and epistemic motivation of the team members. Social motivation of individuals affects the type of information one looks for, generates and processes. Epistemic motivation determines the extent to which new information is searched and generated and the depth of processing this information. This process of group decision making is clearly present in the analyzed case. As P6 indicates, not all available information was shared, whilst input from all actors was required in order to improve decisions. Thus, the social motivation of the actors involved in the negotiation process was pro-self, whilst a pro-social motivation was required. The epistemic motivation of both actors was, however, high, as both spent a great amount of time into improving understanding about the alternatives and testing alternatives. Epistemic motivation can be low or high, consequently changing the depth of information processing on individual level and in turn affecting the information dissemination and integration on group level. As the urgency of the decisions was not extremely high, the high epistemic motivation was appropriate for the situation. However, the combination of high epistemic motivation

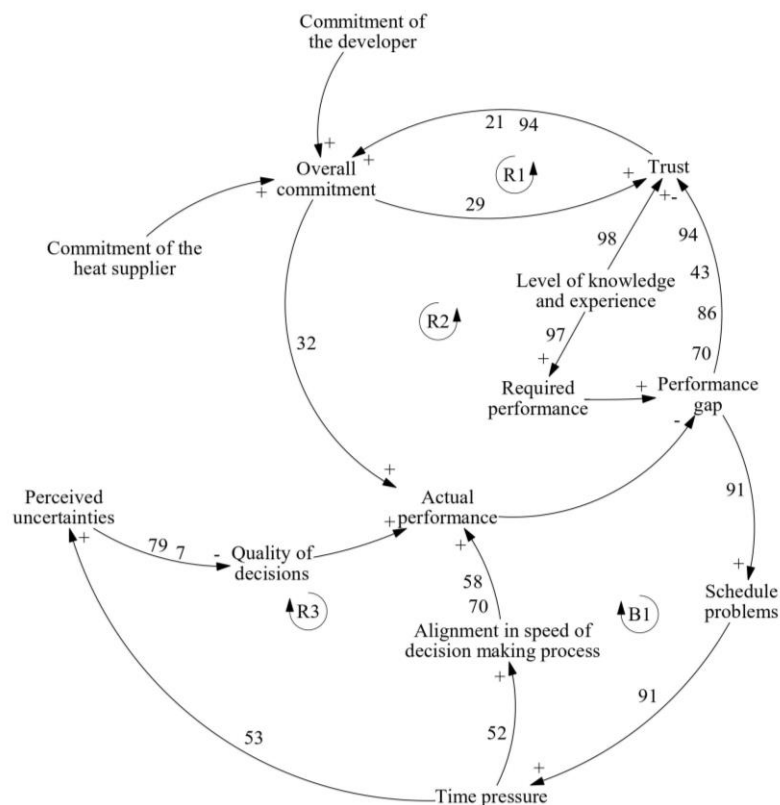


Figure 17: Consequence 2a, time pressure affecting the quality of decisions ('R3').

and a pro-self motivation led to biases in information sharing and dissemination, thus in information on which the group decisions were based, which consequently negatively affected the decision quality. Complementary, as a consequence of the high uncertainty that was present during the process, actors were tentative toward immediate self-interests, instead of longer-term collective interests. This effect was strengthened as trust levels started to decrease, because longer-term collective interests were perceived as too risky. These effects of trust will be further elaborated in the paragraph concerning consequence 3. These results reflect on **insights 2 and 3** from the literature background; 2) **‘The MIP-G perspective can be complemented with a temporal dimension affecting motivation’**; 3) **‘A pro-self, short-term motivation of group members is expected to negatively influence the success of the implementation process (and opposite for the pro-social, long-term motivation)’**.

Consequence 2b - perceived uncertainty and commitment

Second effect of the increased level of perceived uncertainties was the decreased commitment of the heat supplier (loop ‘R5’, Figure 18), as this party experienced more risks and was not certain about return on investment and commitment. Thus, commitment decreased, which consequently caused a decrease in the actual performance again. Contrary, the increased time pressure caused an increase in commitment of the developer (loop ‘B2’, Figure 18). Extra time pressure caused an increase in perceived urgency at the developer which made them more focused on this part of the overall development project and on establishing a collaboration for it. Furthermore, as time passed, other innovations from the innovation dossier became unfeasible, which caused even more focus and desire to succeed with the STG. Even though the innovations from the dossier were on best effort basis, there was a high pressure to make the STG succeed. This effect was strengthened even more by the decreasing feasibility of alternative solutions, as time pressure and costs of alternatives became higher. As one of the interviewees mentioned: *“Time pressure on the one side has the negative effect of not having enough time to further work out innovations, but at a certain moment in time, time pressure has had a positive effect on the STG as well, because we could not go back to fallback options anymore as we chose to follow a certain course of action already.”* (P2, 2020).

What is resulting is a deviation between commitment levels among the actors. Where the developer had a somewhat lower commitment in the start and the heat supplier had high commitment in the beginning, this was turned around in a more extreme variant during the second episode. The differences in commitment levels were as well influencing the actual performance. For instance, via the response time (i.e., a measure of commitment) of involved actors, as mentioned in the following quotes from the interviews.

P1: “The conversations did not go well, people did not respond to each other properly, not fast enough, not concrete enough, so these agreements just weren’t reached. As a result of this we had quite a lot of questions whether we still trusted it or not. Do we still dare to do it?”

P9: “If Heat supplier had played it more cleverly, they could have gotten much more out of it and guarantee themselves much more certainty.” [...] Interviewer: “What did they do to not perform properly?” P9: “They were responding too late.”

Besides, the differences in commitment influenced the trust levels among actors, as the actor that was more committed was getting doubts about the effort of the other actor. This is illustrated in the first quote from the interview with P1.

The findings regarding the effects of uncertainty on commitment of both actors indicate that there exist differences in what effects it can cause. This is according to **insights 4 and 5** from the literature background. Insight 4 states ‘**In literature ambiguity exists regarding the effect uncertainty has on cooperative behavior**’, which is visible in the case in that if uncertainty about whether the project can be finished in time increases, for the developing party this resulted in an increased commitment, whilst for the heat supplier this led to a decreased commitment. This commitment determines how much effort and time actors spent on the project, thus refers to an actor’s cooperative behavior. It consequently affects the performance. Performance, as stated before, is measured in terms of agreement regarding the collaboration agreement. Thus, if commitment, or cooperative behavior, decreases, this results in less

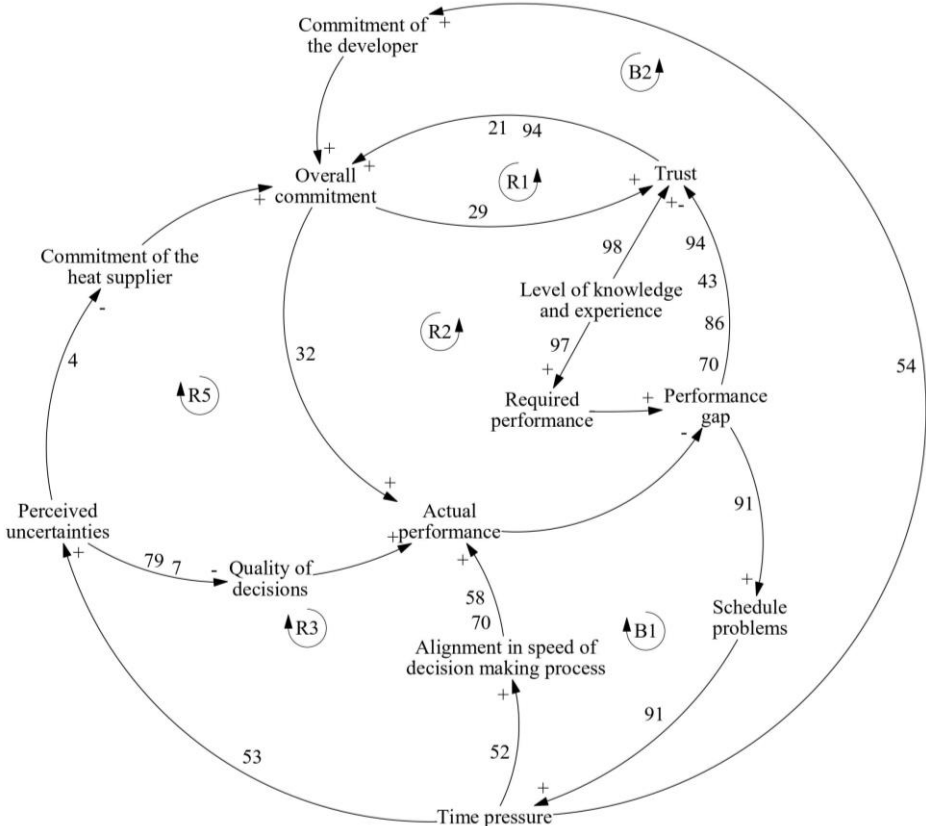


Figure 18: Consequence 2b, time pressure affecting commitment ('R5' and 'B2').

agreement, and the other way around. The decrease in agreement affects the outcome of the negotiation process. As the objective of this stage of the process is reaching a collaboration agreement, it thus affects the created value in this stage. Insight 5 states ‘**In literature ambiguity exists regarding the effects of uncertainties on value creation in projects**’, which thus follows from the reasoning from insight 4. Effects of uncertainty can vary depending on the roles and stakes of the involved actors. Therefore, the ambiguity in literature regarding the effects of uncertainty is a logical result.

Consequence 2c - perceived uncertainty and decisiveness

Third effect of the increased uncertainties is lower decisiveness (loop 'R4', Figure 19). When there is more uncertainty, people have to make their decisions based on a lower (perceived) level of information, which causes postponement of decision making. The following two quotes from the interviews illustrate this.

P5: "I cannot take the decision because I don't dare it yet, I cannot do it yet, I am still uncertain about the decision so I will postpone it."

P7: “Yes, it is not having the courage to make decisions based upon assumptions that you are not 100% sure of. But the point is, you will never be a 100% sure. Or at least, eventually you will, but if you do not dare to make agreements based upon assumptions, on ‘this is the course that we will follow’, then it will remain uncertain until the end. Everybody keeps moving back and forward, is recurring on previous pronouncements, which just makes it really difficult.”

As the second quote indicates, the decreasing decisiveness affects performance. If no decisions are made due to a lack of information, thus due to uncertainty, the project is going nowhere, no agreement is reached. Whilst when decisions are made, regardless of the uncertainties and based upon assumptions, progress is made and eventually uncertainties will decrease due to this progress. Furthermore, these quotes indicate the complexity of working under high uncertainty circumstances. As **insight 6** indicates; ‘**The complexity of the management of the innovation implementation process is expected to increase as a result of uncertainty**’. Reason for the increased complexity is the difficulty of making decisions without full, or with few, information. These is always a risk in making these decisions. However, as P7 outlines, it is necessary to make decisions in order to progress the project. Therefore, managing this process can be perceived complex.

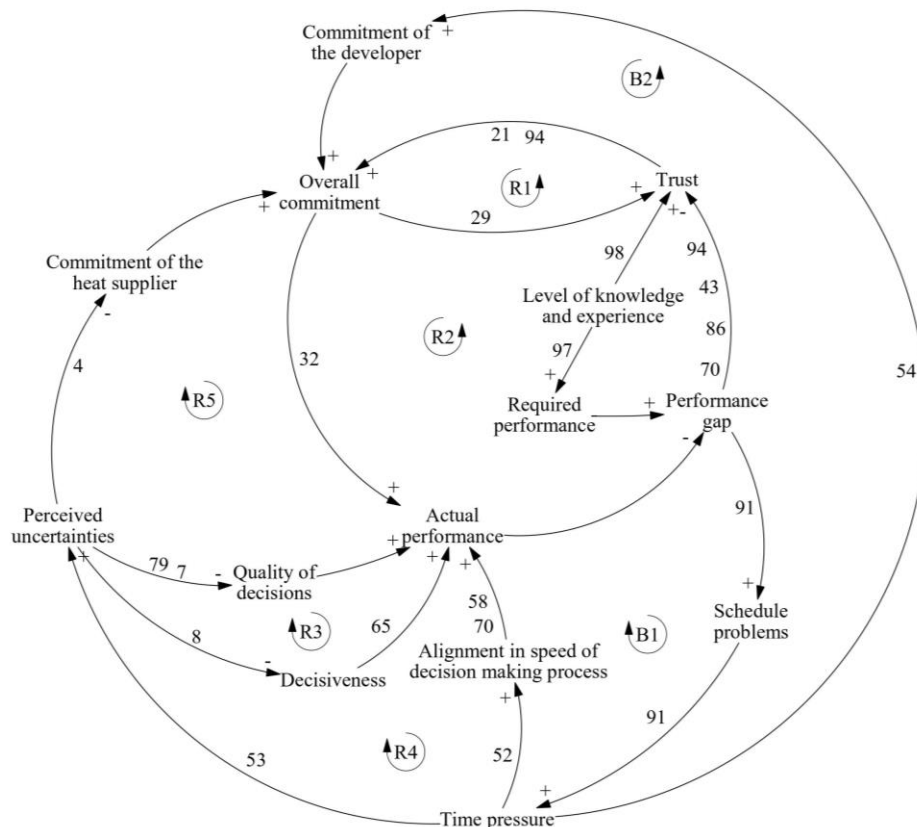


Figure 19: Consequence 2c, time pressure affecting decisiveness ('R4').

Consequence 3 - trust

Next to the increased time pressure and the effects this caused, there was the effect of the decreasing trust level among actors, being the result of not performing as required (i.e., an increasing performance gap). Trust influenced the level of detail in contracts (loop 'R6', Figure 20). When there was more trust, less details were discussed in the contract and the other way around. Thus, during this second episode, the decreased trust caused for a higher amount of required details in the contract. Consequently, this

when increasing, is found to increase the perception of the amount of uncertainty there is in the project (loop 'R7'). From this point, it follows the previously described (see loop 'R3', 'R4' and 'R5') routes affecting commitment and performance.

As stated in **insight 8b**, a collaborative setting can be realized by means of '**motivations focused on the collective good rather than the individual good**'. This concerns the motivations of involved actors. As indicated in the previous paragraph, motivations were pro-self focused. Thus, this complicated the establishment of a collaborative setting, which was required in order to successfully implement the STG.

The importance of trust in the analyzed negotiation process corresponds to the work of Hattori and Lapidus (2004), where they state that in a collaborative setting a **highly invested state of trust** is required (**insight 8a**). A highly invested state is described as fulfilling the four attributes of trust, as stated below.

- a. *“the parties are authentic in their interactions with each other—they say what they mean and mean what they say;*
- b. *they have a history of delivering on their promises;*
- c. *they are able to fulfill their responsibilities within the specific domain of action;*
- d. *they are clearly interested and involved in how their actions will affect each other's well-being.”*

(Hattori and Lapidus, 2004, p.98).

On all attributes both actors generated doubts about the other party's trustworthiness. It was mentioned during the interviews that people took back promises, did not meet agreed deadlines, that negative previous experiences between the parties existed, there were doubts about the capabilities of the other party to really build, operate and maintain the STG, and finally about the pro-self motivations of the other party. All of these aspects indicate low trust and consequently complicate the establishment of a collaborative setting. Furthermore, as can be seen in Figure 20, a change in trust levels among involved actors causes direct changes in the level of detail in contracts, commitment and openness, which in turn affect multiple other variables. Eventually the process follows a feedback loop and turns back to where it started; trust. As actors get trapped into a self-destructive path, trust continues to decrease.

Subsequently, due to this low trust and pro-self motivation, there was no **responsible behavior** toward the collective good or the welfare of everyone (**insight 8d**). Everyone refers to all stakeholders, subcontractors and other involved parties. Furthermore, there was no **outlook for synergy** (**insight 8c**), as this requires high levels of trust and collective good focused motivations as well.

Consequence 4 - perceived uncertainties and details in the contract

Resulting from the expert validations, a causal link between the perceived uncertainties and the level of details in the contract was added. When more uncertainties were present, people tended to desire more detailed contracts in order to protect themselves. They tried to obtain some guarantees for these uncertainties. This relation was also mentioned by one interviewee, due to which it was first left out of the model. This interviewee mentioned *“that especially BuildCO found it very tense due to which they started to incorporate all sorts of clauses into the contract”* (P5, 2020). This relation follows a reinforcing loop ('R8', Figure 21), as an increase in perceived uncertainties led to an increase in the amount of details in the contract, which subsequently led to a higher performance gap as the process costed more time due to these more extensive contracts. The increased performance gap in turn caused

for more schedule problems, thus more time pressure and eventually again even more perceived uncertainties. As outlined in the expert discussion:

Interviewer: “So actually the perceived uncertainties should be connected to the amount of details in the contract in the model?” [...] E2: “Yes, that connection is a good one I believe. It has a direct consequence, we notice it in all contracts, when uncertainties increase, the desire to add something to the contract. So, to arrange it with a high level of detail.”

Second addition resulting from the expert discussion is that of the concept ‘collective experience’, influencing the required information and thus, in turn, the information gap. This collective experience refers to the degree to which the society has experience with the innovation, which generally is low as an innovation concerns something new in some way. This relation is explained by the experts as follows.

E1: “Still one should limit the request for certainties and guarantees about something that we together don’t exactly know of how it works. Despite the fact that your Pavlovian response is to desire all sorts of guarantees about it because you don’t know how it will go.”

E2: “The collective experience is the decrease of uncertainty or the perception of uncertainty, right? It gets more predictable, and that’s the problem with innovations by nature. It is only innovative because we have little experience with it. Otherwise, it wouldn’t be innovative at all.”

E1: “Collective experience, I think that is a very suitable word. It covers both the legal aspects I meant before and other aspects. For instance, that one knows how long such a system works regularly, how much maintenance is required, when it should be replaced. Those kind of things are very complicated when dealing with innovations, of course.”

Thus, one should be careful about what to ask from each other, in order to be able to implement an innovation. Otherwise, performance decreases as the level of details in the contracts is too high for what can be asked and answered, given the low collective experience. However, in the analyzed case, the increased perceived uncertainties made the level of detail in the contract increase as well. Resulting was an increased performance gap, due to longer negotiation (i.e., process) time required to discuss all the details.

After some time, the performance gap increased to such a high level, causing the trust and commitment levels among actors to decrease strongly, that it was decided not to continue the process of setting up a collaboration agreement. Before stopping the process, however, the collaboration agreement was signed in October 2019, although with a resolute condition of reaching agreement about the appendices within two weeks after signing. This agreement about the appendices could not be reached and thus the agreement was dissolved, and no further negotiations followed. The moment when the final decision to quit the collaboration was taken was when another element of disagreement came to the surface and this two-week deadline was not met. This last decrease in the actual performance, thus increase in the performance gap, caused the trust to go below an acceptable level, which made the developing group

willing and ready to make the ‘no go’ decision, despite the consequences that this had for the rest of the project.

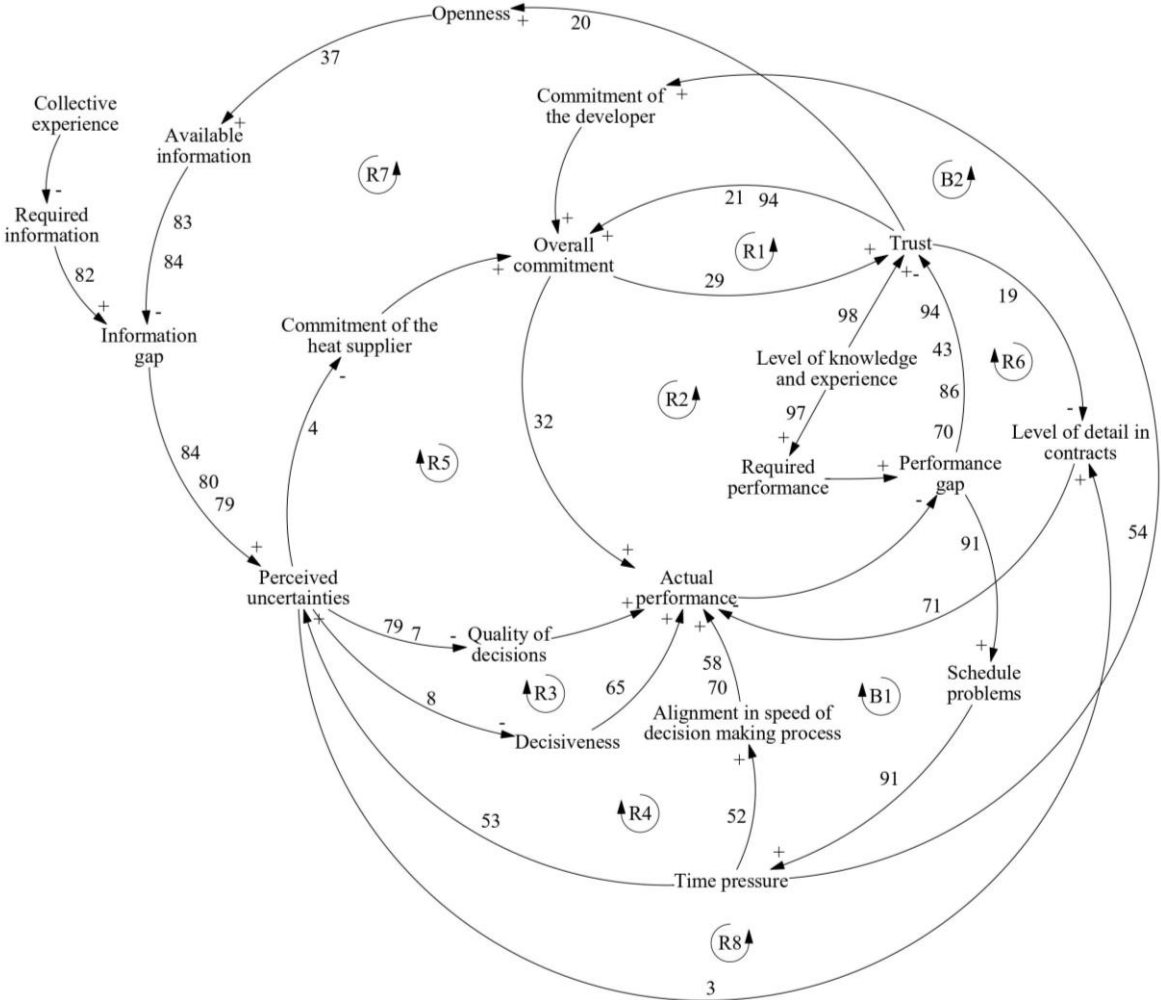


Figure 21: Full model, including consequence 4, perceived uncertainties affecting the level of detail in contracts ('R8').

5.2.5 Episode 3

After a failure in establishing a collaboration with the first heat supplier, the search for another heat supplier started. A small-sized tender procedure was organized, and three companies applied for it. Interesting aspect is the basis on which a choice is made between those three companies. Main criteria were the 1) perceived trust of the tender offer and communication, measured by means of the speed and conciseness of the responses of the parties and their experience, and 2) the alignment of decision-making processes. The following quotes from the interviews denoted this.

P9: "Most trust aroused from the offer from Heat supplier 2, because it already had quite a lot, was a small party and could due to that respond quick. They also just responded very concise and quick during the tender procedure."

P9: "Eventually it was awarded to Heat supplier 2, because they could guarantee that their internal Final Investment Decision could be based upon our planning. Heat supplier 3 couldn't, they needed much more procedure time for it."

Furthermore, during the first two episodes the level of knowledge and experience of the developer increased, they learned. Due to this process of learning, in the third episode their focus is on aspects that

are of great importance for the required trust level for collaboration, namely, the level of knowledge and experience of the heat supplier and the speed and alignment of decision-making processes. Therefore, during the third episode which follows the same CLD (Figure 21), the higher level of knowledge and experience causes increased trust and a decrease in the required performance. This resulted in more actual performance and a decreasing performance gap, eventually leading toward a signed development agreement.

6. Discussion

This chapter presents the discussion of the case study research project. The objective of this study was twofold, namely practical and theoretical, aiming at exploring dynamics underlying the internal process of implementing innovations in the context of sustainability transitions. First, the theoretical implications, limitations and suggestions for future research are discussed. Secondly the practical insights are presented.

6.1 Theoretical implications

The complexity of implementing an innovation into a project within its socio-technical system, in order to contribute to the sustainability transition of that system, lies in both external and internal processes that are involved with it. In this study, the dynamics underlying the internal process were explored. This internal process comprises the establishment of a collaboration with multiple actors, in order to cope with the multi-dimensionality of a transition. This is different from what is defined in this study as external processes, which comprise the appropriateness of the innovation in the socio-technical system where it gets implemented, or the adoption by users (e.g., Schot and Hoogma, 1998; Schot and Geels, 2008; Kemp et al., 1998; Mourik and Raven, 2006). An in-depth case study of an urban area development project, in which the objective is to build free from natural gas, was used to uncover these dynamics. By building natural gas free, it contributes to the transition of the socio-technical system concerning energy, specifically heating. By applying a grounded theory approach (Eisenhardt et al., 2016; Langley, 1999) supplemented with systems thinking (Sterman, 2000), a systems theory is formalized (summarized in a causal loop diagram in Figure 21), for which the internal dynamics of the innovation implementation process are uncovered and codified. It describes how basic collaboration concepts trust, commitment and performance affect and are affected over time by uncertainties, collective experience, alignment of decision making processes, time pressure, and knowledge levels of the actors regarding the implementation of the innovation. The constructed causal loop diagram shows that a series of events occurs when these variables change. Furthermore, literature regarding group decision making and change management is integrated into the context of sustainability transitions, leading to increased understanding of factors that steer actors' behavior, consequences of certain behavior, the underlying mechanisms of these aspects, and their evolvement over time, within the given context. This context is characterized by high uncertainty, multi-dimensionality, and the fundamental nature of the changes (Ahlborg et al., 2019; Folke et al., 2016; Geels, 2006; Grin et al., 2010; Köhler et al., 2019; Zolfagharian et al., 2019). This study serves to add to sustainability transitions literature as described in the following paragraphs.

The key situational factors from change management literature (Hayes, 2002) are integrated into the context of sustainability transitions. From the process analysis in this study, it appeared that the reliability on commitment and energy of others is generally high in negotiation processes in this context, as are the uncertainty about the desired state and the reliance on other actor's data and knowledge. This leads toward the insight that a collaborative approach for change should be applied. In order to do so, following Kotter and Schlesinger (1979; as in Hayes, 2002), involvement of all actors into the process is necessary. Additionally, as Hattori and Lapidus (2004) state, a highly invested state of trust, a motivation focused on the collective good, a synergy outlook and responsible behavior toward the collective good, are required. Whereas this was done accordingly during the first episode of the process, in the second episode the actors failed to do so. This had several reasons.

Firstly, the knowledge and experience actors had concerning implementation of the STG, was lower than the required level. This was due to that the STG is an innovation in the field of heating and cooling

solutions. Consequence was a decrease in trust, as actors doubts about the other party's capabilities to successfully develop, build, operate and maintain the STG, increased. This doubt refers to the absence of the third attribute of trust as described by Hattori and Lapidus (2004). Furthermore, it affected the required performance, as it took more time and effort to complete tasks due to the low knowledge and experience. In turn, the decreasing trust level among actors reduced the commitment of both actors, which subsequently affects the actual performance of the project team (i.e., in terms of reached agreement). A reduced actual performance combined with the increased required performance, led to an increased performance gap. Suboptimal performance does, again, decrease trust among actors.

Secondly, the context of the project in which the STG had to be implemented, together with the 'double effect' risk and information asymmetry between 'now' and the future, caused a high uncertain environment. This is typical in the field of sustainability transitions (Ahlborg et al., 2019; Folke et al., 2016; Geels, 2006; Grin et al., 2010; Köhler et al., 2019), as well as in the field of responsible innovation (Grinbaum and Groves 2013; Kaiser and Moreno 2012; Lee and Petts 2013; Stilgoe et al. 2013). This uncertainty was showed to have four consequences.

(a) The first is a decreased quality of decisions, as not all required information was present and decisions had to be based upon an incomplete set of knowledge (i.e., consequence 2a from the results section). Due to lower quality decisions, actual performance is shown to decrease, subsequently affecting the performance gap and trust levels. Due to this decreased trust, openness among actors decreased they adopted a more pro-self motivation instead of one focused on the collective good. However, for a collaborative relationship this latter is required, this thus affected the successful establishment of a collaborative relationship. Furthermore, due to the decreased openness, it caused a bias in available information for decision making. This effect confirms the MIP-G process as described by De Dreu et al. (2008). The bias comes from the effect of social motivation of an individual on individual information processing, in turn, together with the depth of information processing which is a result of epistemic motivation, causing a bias in the information dissemination and integration on group level. Furthermore, as the uncertainties are partly caused by an information asymmetry between 'now' and the long-term future (Grinbaum and Groves, 2013; Lee and Petts, 2013) and sustainability transition comprise long-term transformation processes (Markard et al., 2012; Kennedy et al., 2018), adding a temporal dimension to the MIP-G model would improve the explanatory capability of the model. This is also corresponding to literature regarding social dilemmas, in which the immediate self-interest is argued to be favored over long-term collective interests (Van Lange et al., 2013), and literature regarding the cognitive patterns vividness and overly discounting the future (Bazerman, 2006).

(b) A decreased commitment from the heat supplier was the second consequence (i.e., no. 2b), as this party saw less potential and more risks in the project due to the uncertainty. This decreased commitment at the heat supplier became visible in the actor's cooperative behavior. Subsequently, this reduced cooperative behavior caused a more pro-self focus, instead of the required focus on the collective good in order to establish a collaborative relationship (cf. Hattori and Lapidus, 2004). Furthermore, the trust level among actors is showed to decrease as a result of decreased commitment and a pro-self motivation. This again reflects on the four attributes of trust (Hattori and Lapidus, 2004), as the fourth attribute regards an actors' clear interest and involvement into how their actions affect each other's wellbeing. Commitment was also shown to affect the actual performance, due to which the potential created value of the project

decreased. This finding corresponds to findings of Browning (2014) and Loftin (2014), indicating the threat uncertainty forms for value creation and project success.

(c) The reduced decisiveness formed the third consequence (i.e., no. 2c) of uncertainty. Due to the missing information, i.e., uncertainty, in the decision-making process, it is shown that often decisions get postponed. However, this reduces progress of the project and thus affects the actual performance. Consequently, as elaborated in previous paragraphs, this affects the trust level among actors and in turn the establishment of a collaborative relationship. The risks that are accompanied with decision making in an uncertain environment are substantial. It requires trust to accept these risks. This led to the notion that trust is about accepting vulnerability based upon one's expectation of good intentions and behavior of another. However, as the context of implementing innovations contributing toward sustainability transitions is characterized by uncertainty and uncertainty is shown to negatively affect trust, realizing a highly invested state of trust is complex. In turn, the establishment of a collaborative relationship in these circumstances is complex as well. The constructed causal loop diagram in this study, suggests pathways to reduce uncertainty and improve trust anyway, such as increasing the openness among actors or aligning temporal cognitions.

(d) Fourth consequence of uncertainty was an increase in the level of detail in the contract (i.e., no. 4). In order to obtain some guarantees for these uncertainties, the involved actors tended to desire more detailed contracts in order to protect themselves. However, a unintended side effect thereof was a reduced actual performance, as it costed more time to negotiate all of the added clauses in the contract. In turn, the performance gap increased and trust levels decreased, which directly and indirectly, via uncertainties, led to even more clauses in the contract.

Thirdly, next to the effects of uncertainty and knowledge and experience of the actors, the temporal cognitions of the involved actors differed. The findings of this study add to existing knowledge about the effects of unaligned temporal cognitions in the process analysis and visualization of the cause-and-effect relations. It is shown that it affects performance, due to the misfit in decision making processes. This corresponds to findings from Gevers et al. (2004), in which it is argued that shared temporal cognitions affect the coordination of team members actions and in turn performance. The conflicting temporal cognitions are exemplified by the planning of the 'final investment decision', which had to be made by the heat supplier before they could give full commitment to the project. The heat supplier's planning of when this final investment decision had to take place differed strongly from the planning the developing party had regarding this decision. This had to do with their varying temporal cognitions, visible in the presence of a object-orientation and a process-orientation in the organization of decision making processes. The effects of these conflicting orientations are for instance studied by Reinecke and Ansari (2015). This study contributes by placing this effect into a broader scope of collaborative processes in the field of sustainability transitions. Furthermore, the study led to the insight that increased time pressure increases the speed of decision making and to a certain extent improved temporal alignment of actors. However, it is also shown that at some point, the increase in temporal alignment stops. This can be explained by that the alignment depends on more than just decision-making speed, as temporal cognitions express perceptions, evaluation and spending of time through cycles and rhythms of activities, sociotemporal norms, schedules and deadlines (Gevers et al., 2004). Furthermore, as shared temporal cognitions were lacking during the process, performance decreased. In turn, this resulted in lower trust, as a result of lacking ability to fulfill responsibilities within the specific domain of action, as the set deadlines for the final investment decision could not be met by the heat supplier, as these did

not fit into their own temporal planning. This lacking ability to fulfill responsibilities is one of the four attributes for trust and the establishment of collaborative relationships.

Fourth, and finally, the initial time pressure of the project was high, increasing the perceived uncertainties and in turn the commitment of the heat supplier (i.e., the subcontractor), which negatively affects the actual performance. However, it also led to increased commitment among the developing party (i.e., the contractor) which positively affects the actual performance. The conflict in commitment levels does however negatively affect trust, as the more committed actor questions the capabilities and intentions of the less committed actor.

The uncovered causal relationships are contributing toward the understanding of mechanisms underlying these type of internal processes. Improved understanding thereof, opens up ways to interfere in this process to increase the success of innovation implementation in order to stimulate sustainability transitions. This complements the existing knowledge regarding external aspects affecting innovation implementation success in the literature field of sustainability transitions.

This study answers to the gap in existing knowledge regarding dynamic analysis of trust development in negotiation processes (Kong and Yao, 2019; Lewicki et al., 2006). Variables affecting the development of trust over time are uncovered and feedback loops are constructed. It is perceived useful as trust is a critical factor during negotiation (Lewicki and Polin, 2013) and thus affects the quality of the outcome of the negotiation. Subsequently, it affects the success of implementing innovations in the context of sustainability transitions.

6.2 Limitations and future research

Regarding the set-up of this study, some limitations are present. First, the selection procedure of what cause-and-effect relations are incorporated into the model is somewhat subjective. A procedure is used that the relation should be at least mentioned during two of the nine interviews. However, some additional relations are added after the expert validation, even while they were only mentioned once or not at all during the interviews. Therefore, the opinion of the experts has got a higher weight in the selection of relations, which can be explained due to their extensive experience regarding similar projects to the one analyzed. Furthermore, the measure of ‘times mentioned in different interviews’ is arguable, as some interviewees discuss fewer aspects more thoroughly or opposite. Besides, the interview durations differentiated. These aspects make the appropriateness of the measure ‘times mentioned in different interviews’ somewhat arguable. Furthermore, as the interview questions were open-ended, interviewees can possibly discuss other topics that come to mind, whilst they do recognize cause and effect relations mentioned in other interviews. For instance, when they perceive those relations as self-evident. Finally, the number of interviews is sufficient, although more interviews would make the results more reliable. As the project team did not comprise more people than the nine ones that were interviewed, there was no opportunity in this case to conduct interviews with more people than the nine people that were already interviewed. Alternative solution for this limitation would be more interviews with the same interviewees at different moments in time. This would be especially beneficial for analyzing the current process in reaching a collaboration agreement with the second contractor for the realization of the Smart Thermal Grid, as the negotiation process with the first potential contractor was already finished during this research project. However, by making all choices and argumentation clear in the method and results section of this study, the reliability is attempted to be ensured.

During the interviews, multiple exogenous factors influencing the negotiation process were mentioned. For instance, political pressure is mentioned in several interviews to affect the process. It made it more

difficult to take the “no-go” decision during the negotiations with the first party, whilst the process did not express much expectations anymore. These type of factors are, however, not incorporated in the theory as they vary per context of the case. The effects they have are not studied in this research, which can form some limitations regarding the conclusions that can be drawn from the effects visualized in the causal loop diagram. Reason is that the effects from the variables in the model can be influenced by these exogenous variables and thus not fully represent the ‘real’ effects. By testing the theory on its applicability on other cases, the presence of these limitations can be investigated and resolved. Additionally, retrieved knowledge can be advanced by means of process comparisons in the form of cross-case replication, or by means of process decomposition through longitudinal replication (Langley et al., 2013). However, by having the model without these exogenous factors validated during the expert validation session, its validity for both the analyzed case as other similar projects is ensured to a certain extent. This does not change the importance of remembering that *“All decisions are based on models ... and all models are wrong”* (John Sterman, as in his article in *System Dynamics Review*, 18, 2002, p. 525). As the existing knowledge on the topic is minimal, this study is a first exploration of the dynamics underlying the analyzed process, of which critical reflection to improve external validation is encouraged.

The single case study restricts the generalizability of the constructed systems theory and causal loop diagram to some extent. Therefore, future work can test the theory of how negotiation processes evolve over time and refine or add to it by means of analyzing other cases. This will increase its generalizability and validity. An example of a case can be another type of innovation being implemented in an urban area development project in the same area, or a similar innovation being implemented in an urban area development project at another location, where other rules and legislation are to be pursued. The former would contribute to the applicability of the proposed theory in other socio-technical systems that are or should be in transition. The latter contributes to improvements of the theory within the socio-technical system regarding energy through a wider scope; from the Dutch energy system to an international perspective.

Additionally, other aspects, besides negotiation, of internal processes in the context of implementing innovations contributing toward sustainability transitions should be analyzed to further improve chances of successful implementation of niches becoming the new, more sustainable regime and thus stimulate sustainability transitions of the system. This can both comprise the socio-technical system of energy, in the Netherlands or in other countries, and other socio-technical systems such as for instance infrastructure. The insights in other socio-technical systems can furthermore be compared to those of the energy system and potential overlap or interrelatedness of socio-technical systems can be explored.

The theory built in this study serves to explain why organizations aiming at implementing innovation in the sustainability transition context, might get trapped in a self-destructive path, even though their seemingly rational decisions and actions. The exact levels of uncertainty, knowledge and experience and alignment of decision-making processes that cause a tipping point from a self-destructive toward a self-constructive path cannot be deduced from the findings and thus form base for further research. This can further improve the process of implementing innovations in the context of sustainability transitions.

Further research can be focused on deeper understanding and exact measures of the effects regarding the alignment of the decision-making processes of the involved parties. It was outlined during the expert validation as important factor influencing the failure of coming to an agreement with the first actor, and for success with the second. In literature, the effect of misalignment or conflict in temporal organization of processes or group tasks is studied as well (e.g., Reinecke and Ansari, 2015; Gevers et al., 2004).

Moreover, as Barkema et al. (2002, p.920) outline: “Managing diversity would seem to be one of the most difficult - but also one of the potentially most rewarding - management challenges for global firms competing in the early 21st century”.

6.3 Practical implications

This study responds to a desire from practice for the clearance of the complexity of collaborative projects aiming at implementing sustainable innovations. It provides an in-depth understanding of negotiation processes aiming at implementing innovations to stimulate and contribute toward the sustainability transition of socio-technical systems. Specifically, it is focused on the socio-technical system for energy in the Netherlands. The findings indicate how, as a result of the interplay of high uncertainty, low knowledge and experience levels and lacking shared temporal cognitions, actors get trapped into a self-destructive path. On the other hand, it shows that when still exposed to high uncertainty, but also with improved trust relationships, increased knowledge and experience levels and alignment of decision making processes (i.e., due to an increased amount of shared temporal cognitions), this self-destructive path can be interrupted and transformed into a self-constructive path. Therefore, this study provides insights for project developers, heat suppliers, municipalities, consultants and other stakeholders aiming at contributing toward sustainability transitions in order to address environmental problems. Several practical recommendations are suggested and discussed in more detail in the following paragraphs.

Firstly, the importance of trust is highlighted in this study. Actively steering upon trust building would improve the possibility of establishing a collaborative relationship among actors. The four attributes of trust should be given attention, being 1) the authenticity of interactions with each other, thus, actors say what they mean and mean what they say; 2) involved actors should have a history of delivering on their promises; 3) responsibility should be taken, thus commitment should be present, and actors need to be able to fulfil that responsibility; and 4) motivations of involved actors should be focused on the long-term collective good, rather than on (short-term) individual gains (Hattori and Lapidus, 2004). Approaches to realize these attributes are firstly, openness regarding information sharing, training or learning, to assure responsibility can be taken by everyone, and secondly, determining with involvement of all actors what the shared objectives of the collaboration are (Hattori and Lapidus, 2004). Managers should put effort in preventing actors to comply to only their own interests instead of those of the collective (Hattori and Lapidus, 2004).

Second highlighted aspect are temporal cognitions. The findings suggest that actors involved in the process should become more aware of the temporal cognitions of all the involved actors and all individuals involved in name of those actors. This can be done by reflecting upon time, i.e., by applying temporal reflexivity (Gevers et al., 2004; Reinecke and Ansari, 2015). As suggested by Gevers et al. (2004), actors can collaboratively monitor whether they finish tasks according to plan, and where adjustments are necessary to reach certain temporal milestones. Discussion of progress and early analysis of unforeseen events can create the opportunity to reallocate resources, speed up processes, or to alter schedules. This requires an adaptive attitude towards the project work from all team members. Furthermore, complementary to the temporal reflexivity on action, schedules and progress, teams can apply temporal reflexivity regarding the temporal structures and assumptions they perceive as ‘truth’ (Reinecke and Ansari, 2015). Contestation and dialogue may induce actors into questioning, describing and potentially rethinking their structures and assumptions. These temporal structures and assumptions can be the result of organizational practices and culture, or individual perceptions of time. Discussing the organizational processes of each of the involved actors at the start of the process of negotiating a collaboration, i.e., ‘temporal brokerage’, is expected to improve understanding of contrasting

perspectives (Reinecke and Ansari, 2015). Being able to view temporal structures and assumptions from another perspective, can move from an orientation favoring just one's own perspective, towards a broadened view, eventually leading towards more shared cognitions on time. However, as the context comprises inter-organizational collaboration, certain temporal structures or assumptions cannot be adjusted toward the specific project, as multiple projects play simultaneously. In those cases, it would be useful to identify the potential risks caused by conflicting temporal structures and assumptions of the different involved actors. Early identification offers the opportunity to adjust the project plan in such way, that those risks are covered. Additionally, two other aspects are suggested to move towards shared temporal cognitions (Gevers et al., 2004). The first is goal setting, which firstly regards identification of the collective objectives, followed by prioritization of these goals. Before being able to critically reflect, goals upon which to reflect together should be set. By collectively setting these goals, they are better understood by all project members and responsibility toward these goals increases. The other aspect is temporal planning, which focuses more on how to achieve the determined goals. For instance, by division of labor, assignment of roles and responsibilities and forming a strategy for dealing with unforeseen events. The established timelines can function as temporal boundaries objects, allowing involved actors to negotiate and coordinate their work.

Third highlighted aspect is coping with uncertainties. Similar to the implication to reach a high level of trust among actors, open sharing of information is suggested as approach to cope with uncertainty (Interviews P5, P6, E1 and E2, 2020). In this way, all available knowledge and experience from all actors is combined and available to everyone. Furthermore, this reduces the occurrence of biases in information dissemination and integration on group level in order to make decisions, due to open information exchange and due to actors' disposition to trust increases as a consequence of openness (De Dreu et al., 2006, 2008; Lopez-Fresno et al., 2018). It also requires an adaptive attitude of all actors, as quick responses to unforeseen events are critical in environments characterized by uncertainty.

Furthermore, the established causal loop diagram allows for discussion within the project team at various moments during the project; what can happen during the process, where in the process they are, what is happening and what can be done to improve the process (Expert discussion, 2020). Thus, they can intervene in the self-destructive path if they find themselves there, or they can even prevent getting there (Expert discussion, 2020). An example of such an intervention is an open discussion of the process with the involved actors, to create awareness and understanding of what is happening and why action is (or is not) required. Furthermore, all separate variables can be steered upon as well. For instance, one can actively steer on more trust or on shared temporal cognitions. The detailed knowledge on how such problems fail and the underlying reasons for it, might prevent managers to respond too late to self-destructive paths in the future.

7. Conclusion

The objective of this study was to explore the dynamics that underlie the internal process of implementing innovations contributing to sustainability transitions. Internal refers to the organizational aspects of the implementation, such as negotiating collaboration in order to cope with the multi-dimensionality of sustainability transitions. Contrary to what in this study is defined 'external' (e.g., alignment of system levels and institutional barriers), literature on the internal aspects is limited. This led to the following research question: *“What dynamics underlie the negotiation process of implementing innovations in the context of sustainability transitions?”*. This question was addressed by means of an in-depth case study of the process of implementing a Smart Thermal Grid for heating and cooling into an urban area development project in the Netherlands and resulted in a CLD (Figure 21).

Firstly, the data from in total ten interviews and an extensive base of various types of project documentation were used for the in-depth case study, providing insights in the dynamics underlying a negotiation process in the given context. Detailed knowledge on these might prevent practitioners in the field to fall into the same trap of a self-deconstructive negotiation path in the future. Furthermore, if they notice what is happening, they might intervene quicker, when it is still possible to resolve.

Secondly, the findings validated the importance of trust in the negotiation process for implementing innovation, corresponding to the expectations based upon negotiation and change management literature (e.g., Hayes, 2002; Kong and Yao, 2019; Sørensen et al., 2011). Furthermore, the analysis of the process over time answers to the literature gap as outlined by Lewicki et al. (2006) and Kong and Yao (2019), as it provides insights in trust development during negotiations. Trust is shown to influence a) the amount of shared information within the group via openness, b) the process time, as part of performance, via the level of detail in the contract, and c) the commitment.

Thirdly, the findings demonstrated the role of uncertainties in the negotiation process, which is found to be a critical factor for performance, via multiple routes. At first, increased uncertainty caused decreased commitment of the heat supplier, leading to a reduced willingness to cooperate, which is according to findings from Budescu et al. (1990) and Gustafsson et al. (1999). Secondly, it decreases the quality of group decisions, confirming statements from De Dreu et al. (2008). Thirdly, however, the results also showed an increase in the amount of details in the contract, as consequence of higher uncertainty, leading to lower performance due to longer process times and in turn decreasing trust.

Fourth conclusion is the influence shared temporal cognitions, and specifically the speed of decision making processes, of the involved actors has on performance. Findings show that it is affected by time pressure, due to which decision making speed increases, which makes the processes more aligned in high speed as well. However, this effect is strongly influenced by the size, character and organization of the actors, which does or does not allow for changes in decision making processes. Therefore, the increase in alignment of speed does have a maximum at which it cannot increase any further, as speed is only a part of the temporal aspects affected by temporal cognitions. The lack of shared temporal cognitions then starts to decrease performance and is detrimental if not aligned.

Finally, practical recommendations are provided to project managers or team members from various type of organizations, such as developers, heat suppliers, municipalities etc. Key are the discussion and shared understanding of the dynamics underlying the processes that they are in; actively steering upon shared temporal cognitions; openness in information sharing; and putting great effort in compliance to shared objectives instead of individual. This could prevent from getting trapped into the self-deconstructive path as described in the theory. In all, this study uncovered the dynamics underlying a process of negotiation aimed at implementing innovations in the context of sustainability transitions.

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Appendix A: Temporal aspects

Table 6 consists of an overview of studied temporal aspects.

Table 6: Temporal aspects, their definitions and references to research on them

Construct	Definition	References
1: Urgency and prioritizing	<p>Urgency: “The feeling of being chronically hurried” “General hurriedness”</p> <p>Urgency as a result of time pressure (i.e. imposing a (tight) deadline).</p> <p>Prioritizing: The selection of preferences.</p>	<p>Chen and Nadkarni (2017); Kunisch et al. (2017); Conte, Landy and Mathieu (1995); Karau and Kelly (1992, 1999, 2004); Adam (1995)</p>
2: Temporal focus	<p>Temporal orientation towards past, present and future.</p> <p>Long term vs. short term focus.</p> <p>The temporal horizons that are assumed, e.g. clock-time constructed the market as its horizon. And in turn, the market is based upon its own horizons, such as financial reporting cycles.</p>	<p>Kunisch et al. (2017); Reinecke and Ansari (2017); Nadkarni et al. (2016); Flammer and Bansal (2017); Crilly (2017); Adam (1995); Reinecke and Ansari (2015)</p>
3: Rhythm	<p>Rhythm: the ordered repetition or recurrence of a pattern of certain activities. E.g. organizational or environmental rhythms.</p> <p>Rate of recurrence: The frequency of situations and events repeating.</p> <p>For example, industry or product life cycles: The cycle through which a product goes from introduction to withdrawal or demise.</p>	<p>Definition: Merriam-Webster dictionary (2019); Structure: Adam (1995); Hopp and Greene (2018); Khavul et al. (2010); Shi and Prescott (2012); Zerubavel (1985) Barkema, Baum and Mannix (2002);</p>
4: Synchronization	<p>Synchronization: The ‘entrainment’ of something, e.g. the temporal fit of organizational and environmental rhythms, or the temporal fit between activities of individuals</p>	<p>Adam (1995); Barkema, Baum and Mannix (2002);</p>

	Temporal symmetry: The process of synchronizing the activities of different individuals	Zerubavel (1981)
5: Duration, schedules and deadlines	<p>Duration: The time during which something exists or lasts. The continuance in time.</p> <p>Schedules: A procedural plan that indicates the time and sequence of each operation; a program.</p> <p>Deadlines: A date or time before which something must be done.</p>	<p>Definition: Merriam-Webster dictionary (2019);</p> <p>Structure: Adam (1995); Zerubavel (1985);</p> <p>Definitions: Merriam-Webster dictionary (2019);</p> <p>Structure: Zerubavel (1985)</p>
6: Speed, tempo and search	<p>Speed: How fast decisions have to be made.</p> <p>Tempo: Speed and diversity of decision making and execution.</p> <p>Search: Speed of acquiring new knowledge and antiquation of old knowledge.</p>	<p>Adam (1995); Barkema, Baum and Mannix, (2002); Perlow, Okhuysen and Repenning, (2002); Baum and Wally (2003); Eisenhardt (1989); Dykes et al. (2018);</p> <p>Barkema, Baum and Mannix (2002)</p>
7: Pacing style	<p>How individuals and groups tend to use time and temporal milestones to guide their work and evaluate task progress, when faced with a deadline.</p> <p>The direction and intensity of a person's attention and effort</p>	<p>Barkema, Baum and Mannix (2002); Chen and Nadkarni (2017); Gevers and Rispens (2016);</p> <p>Brown and Eisenhardt (1997)</p>
8: Timing	Timing: Moment of action (e.g. of entering the market or executing a strategic response). Oftentimes related to the window of opportunity, which is about entering the market at the right time.	Adam (1995); Pettus et al. (2017); Hawk et al. (2013); Suarez and Lanzolla (2007).
9: Temporal consensus	A shared understanding among team members regarding the temporal aspects of their collective tasks. It indicates the level of agreement in approaching a collective task, despite individual differences concerning time.	Gevers & Peeters (2009); Gevers, Van Eerde, & Rutte (2009); Gevers, Rutte, & Van Eerde (2004)

Appendix D: List of interviewees

In Table 7 the interviewees are listed.

Table 7: List of interviewees including company name, role and period of involvement

Name	Organization	Role	Period
P4	Heat supplier	Project manager	May 2018 - June 2019
P7	BuildCO and Partnership	Real estate developer	May 2019 - currently
P6	Municipality	First contact municipality / project coordinator	April 2018 - currently
P1	Witteveen+Bos	Consultant energy solution	May 2018 - currently
P2	(Witteveen+Bos and) Partnership	Process manager Partnership	April 2018 - currently
P3	Heat supplier	Project manager	May/June 2019 - November 2019
P5	Witteveen+Bos	Project and innovation manager and later consultant design of the public space	May 2018 - currently
P8	DevelopCO and Partnership	Project manager	May 2018 - June 2019
P9	Consultant	Consultant	January 2019 - currently

Figure 23 indicates the involvement of the interviewees (P1 - P9) during the process, marked by the colored lines.

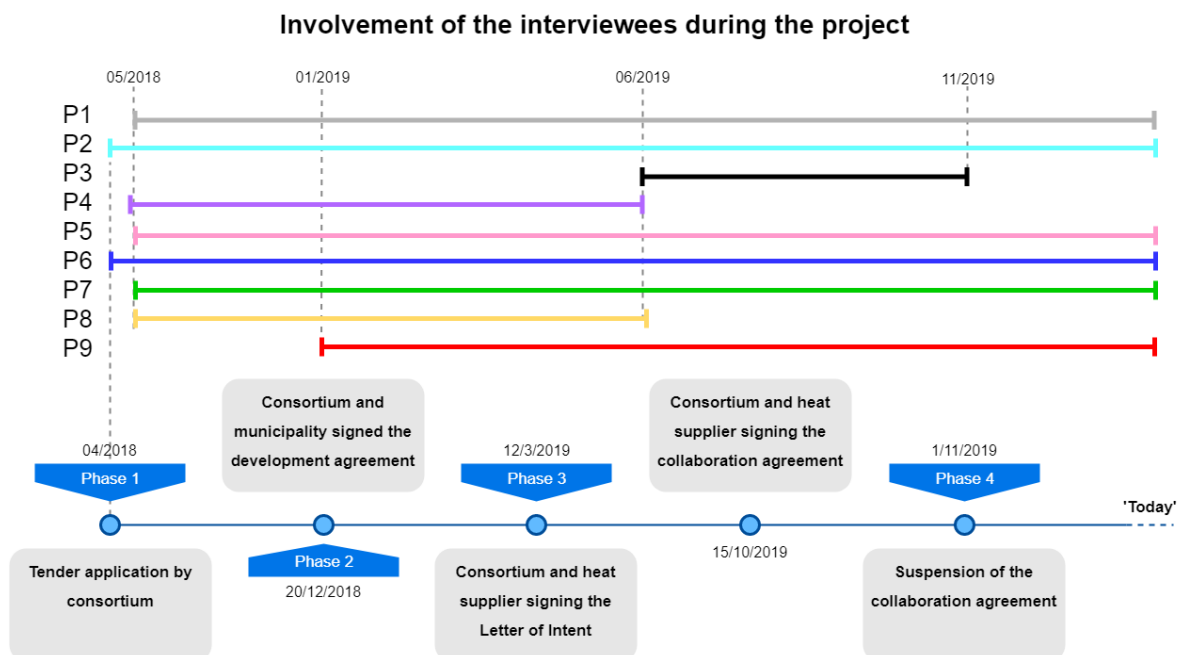


Figure 23: Involvement of interviewees denoted above the timeline of the process

Appendix E: Interview protocol

Doel van het onderzoek

Ten behoeve van de beoogde verduurzaming van Nederland, wordt d.m.v. dit onderzoek getracht te achterhalen welke factoren invloed hebben op het succesvol implementeren van duurzame innovaties in gebiedsontwikkelingsprojecten. Het gaat hierbij om directe en indirecte effecten van bepaalde besluiten, acties en andere factoren die van invloed zijn op het proces. Deze worden dynamisch (d.w.z. ‘zich afspelend over tijd’) weergegeven (* <CLD voorbeeld>). Hiervoor is het van belang dat inzicht wordt verkregen in de oorzaak-gevolg relaties tussen deze factoren. Uiteindelijk biedt deze dynamische weergave beter begrip van processen die zich afgespeeld hebben gedurende het project en in eerste instantie soms te complex zijn om te bevatten of voorzien. Dit kan bijdragen aan besluitvorming in gelijksoortige projecten waarin de implementatie van duurzame innovaties een doelstelling is. Om de dynamische oorzaak-gevolg relaties goed in beeld te kunnen brengen, is gekozen voor een in-depth case study naar het project Expo en specifiek de implementatie van het Smart Thermal Grid (STG) in dit project.

Vorbereiding voorafgaand aan het interview

- Twee recorders (laptop en mobiele telefoon).
- Notitieboek en schrijfmateriaal.
- Lijst met planning en contactpersonen.
- Tijdlijn van het STG proces.
- Invulblad grafieken.
- Semigestructureerde vragenlijst.

Introductie

- Vraag toestemming om het interview op te nemen.
- Geef een introductie en achtergrond van de interviewer.
- Leg het doel van het interview uit.

Vergaar informatie over de geïnterviewde

- Rol in het project.
- Duur van betrokkenheid bij het project (noteer op tijdlijn).

Vragen, (deels) gestuurd aan de hand van de tijdlijn

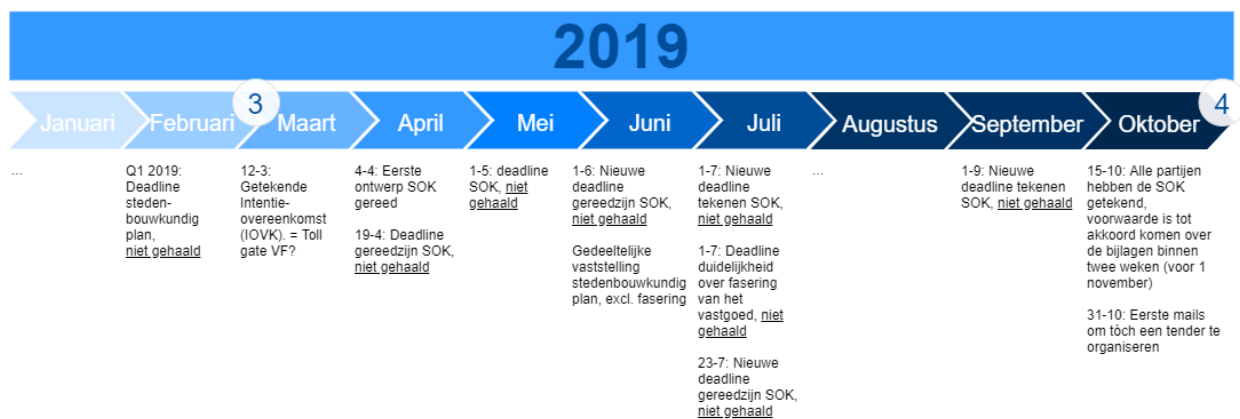
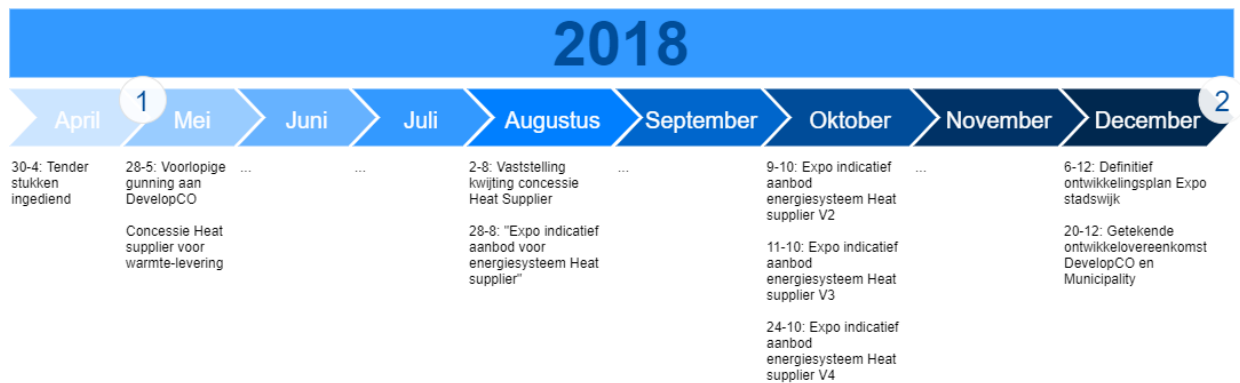
- Vragen conform question guide.
- Stel open vragen, indien mogelijk. Anderzijds vraag door na gegeven antwoord om meer gedetailleerde informatie te verkrijgen.
- Wanneer relevant, vraag om verdere toelichting of uitleg en meer diepgaande vervolgvragen om de context van de antwoorden te begrijpen.
- Stel de vragen zonder vooroordeel voor een antwoordrichting.

Terugblik en einde

- Vraag of er nog toevoegingen of onderwerpen zijn die de geïnterviewde graag nog zou aankaarten en die niet aan bod gekomen zijn.
- Bespreek of er suggesties zijn voor andere personen die geïnterviewd zouden kunnen worden en of daar contactgegevens van beschikbaar zijn.
- Bedank en beëindig interview.

Tijdslijn

Met behulp van onderstaande tijdslijn zal in het interview besproken worden wat er gebeurt in het proces en waarom.



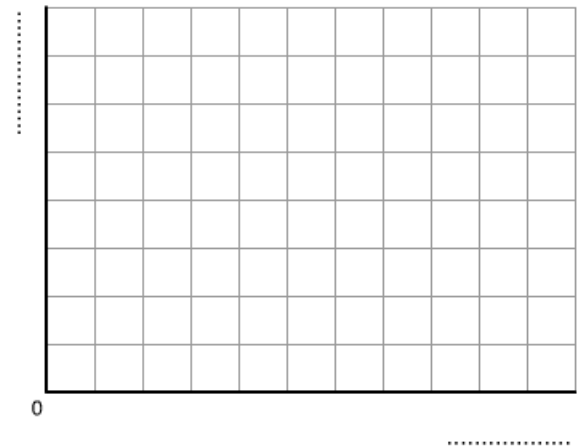
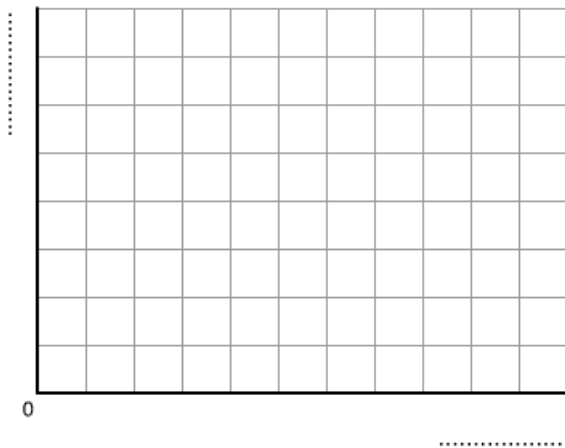
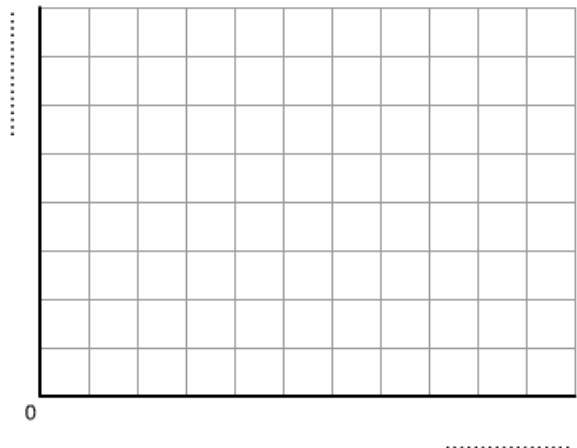
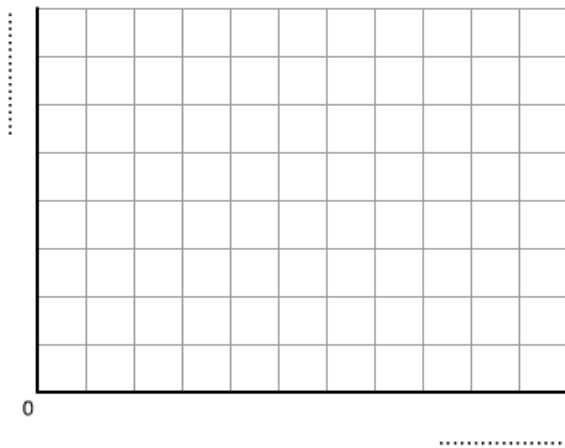
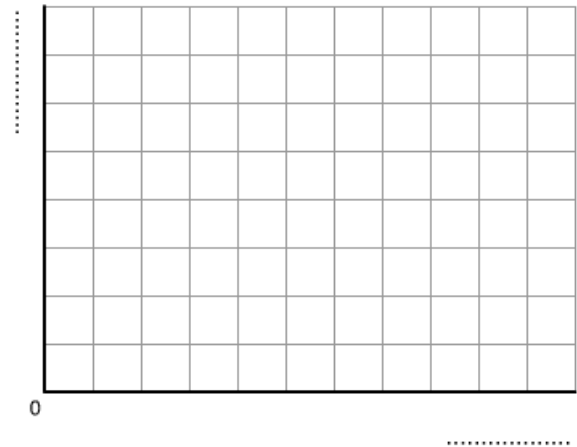
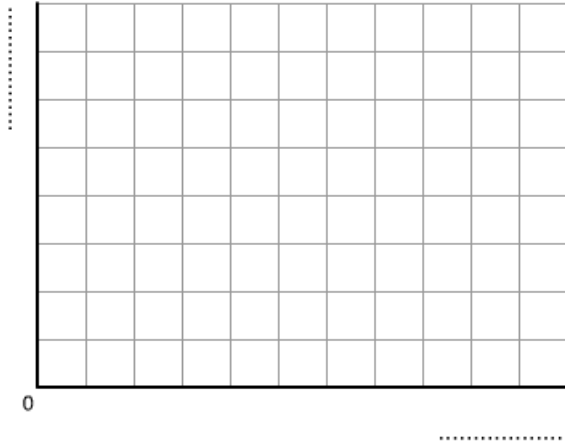
Interviews - vragen

Onderstaand de questions guide voor de interviews.

- 1) Wat is de achtergrond van de geïnterviewde? Wat was uw rol in het project en hoe lang was u betrokken, wat is uw functie nu, wat houdt dit in?
- 2) Hoe draagt, volgens uw ervaring, het implementeren van het STG bij aan de algemene projectdoelstellingen en die specifiek voor het onderdeel warmte en koude voorziening?
- 3) Wat zijn in uw ervaring de factoren die het succesvol implementeren van het STG beïnvloedden? Hoe hebben deze factoren invloed (hoe werkt dat) en waarom?
Suggesties voor wanneer dit lastig gevonden wordt: Hoe zit het dan in termen van tijd(sdruk), financiële aspecten, doelstellingen en ambities, risico's, contractuele beperkingen, stress, mate van overeenstemming, mate van commitment/toewijding, besluitvaardigheid, vertrouwen, kennisniveaus, transparantie?
 - a. Welke daarvan hebben op wat voor manier uiteindelijk geleid tot het beëindigen van de samenwerking met Heat supplier en de huidige voortgang met Heat supplier 2?
 - i. Hoe zou u de relatie tussen de door u genoemde factoren omschrijven, eventueel met behulp van een grafiek? Dus bijvoorbeeld hoogte van gestelde ambities op de x-as en de benodigde hoeveelheid geld op de y-as, hoe wegen ze tegen elkaar af? Gebruik hiervoor de grafieken van de bijlage of licht mondeling toe.
 - ii. Hoe zou u het gedrag (m.b.t. de genoemde factoren) over tijd omschrijven (/visualiseren in een grafiek)? Bijvoorbeeld, de hoeveelheid geïnvesteerd geld over de tijd, of de mate van onzekerheid over de tijd? Of de focus op doelstellingen over de tijd? Wellicht veranderde een van deze factoren en de aandacht daarvoor/ investering daarin gedurende het project?
- 4) Als u deze tijdlijn ziet (zie pagina 2), ontbreken er hierin dan nog belangrijke onderdelen of gebeurtenissen? Hoe zou u omschrijven wat er gebeurt? Wat valt u het meeste op? Wat is het meest interessant of zorgwekkend?
- 5) Gebaseerd op uw ervaringen, waarom denk je dat hetgeen gebeurt wat u omschrijft? Onder welke omstandigheden wordt besloten hetgeen te doen wat u omschrijft en door wie?
- 6) Welke consequenties, positieve en/of negatieve, van dat besluit heeft u ervaren in het project?
 - a. Indien er negatieve consequenties genoemd zijn: Zijn er oplossingen toegepast t.a.v. de genoemde negatieve consequenties? Zo ja, welke? Zo nee, waarom niet?
 - i. Hebben de toegepaste oplossingsrichtingen indirecte effecten waar u zich bewust van bent/die u hebt ervaren? Kunt u die toelichten?
 - b. Zou u zelf nog andere oplossingsrichtingen of methoden kunnen noemen voor genoemde consequenties?

Interviews - grafieken

Onderstaand de in te tekenen grafieken die de relaties tussen variabelen en het gedrag over tijd weergeven.



Appendix H: CLD

