INTEGRATING SUSTAINABILITY INTO MARINE INFRASTRUCTURE PROJECTS

DESIGNING A SUCCESS FACTOR MODEL FOR CONTRACTING ORGANIZATIONS

MSc Thesis Report, Fenja D. Schuylenburg

TU Delft Delft University of Technology

Van Oord Marine ingenuity

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Integrating Sustainability
into
Marine Infrastructure Projects

Designing a Success Factor Model for Contracting Organizations

by
Fenja Desirée Schuylenburg

In partial fulfilment for the degree of

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in Construction Management and Engineering
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PREFACE

Ever since I started my master's degree at TU Delft, I became more and more aware of the impact that construction has on its social – and physical environment. Despite its value adding function, it may also threaten its surroundings, which triggered my interest in more sustainable construction practices.

> *"Transforming management theory and practice so that they positively contribute to sustainable development is […] the greatest challenge facing the Academy of Management"*
> (Gladwin et al., 1995)

Gladwin's quote points out the managerial challenge of integrating sustainability, which even after 25 years of related research still exists. At the same time, I believe that with an increasing "projectification", it is crucial to advance the discussion surrounding sustainable management practices in projects. With my degree in construction management and engineering, I felt just exceptionally well suited to address this challenge.

The past six month I had the great opportunity to study the integration of sustainability in the context of marine infrastructure projects. Joining Van Oord and exploring the world of "marine ingenuity" took me on a voyage of discovery. During this time, I was supervised by a great committee, which supported me along the way and helped me to excel throughout the process.

Marcel, thank you for inspiring me to a greater purpose. Throughout your courses, I became increasingly aware of the role of constructing infrastructure and its prospect value for society. By connecting me to Van Oord, you significantly contributed to my journey. During the meetings, I felt constructively challenged, which helped me to see things in perspective. *Maedeh*, you always gave me the opportunity to schedule a meeting and discuss my thoughts, which helped me to structure these and to keep on track. Thank you for your guidance, it assisted me to shape my research. *Fransje*, I am happy that Marcel introduced us. During our sessions, you intrigued me to think out-of-the-box and to integrate different perspectives. Your enthusiasm and constructive feedback were great support.

I would also like to thank *Rachel*, who as my daily supervisor within Van Oord introduced me to practice, helped me to build a network and provided me with the necessary tools to conduct the research. For your personal support throughout the process I am especially grateful. This helped me to feel empowered and to flourish. *Sander,* thank you for your guidance. In your position as sustainability manager, you helped me to see the broader picture of the business. I also appreciate the time and energy other colleagues devoted to me, by joining my interviews – or validation session.

Last, I want to acknowledge my family and friends, you backed me up throughout my whole master's, even if physically separated. Your understanding and love helped me to persist for achieving my goals.

With this thesis I wanted to challenge myself, enrich theory, provide tangible results for practice and foremost enjoy the voyage of discovery. I did and I am very proud to present my final results.

Fenja Schuylenburg

Delft, September 2019

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EXECUTIVE SUMMARY

Research background and motivation

The **"industrialization of the ocean"** accelerates as emerging sectors such as offshore wind are developing. Furthermore, in response to global challenges, such as climate change and population growth, the need for marine infrastructure increases to support development. Examples are: harbours, - artificial islands, and coastal defence structures. For constructing these assets, **dredging** is needed, which is associated with severe environmental impacts, large influence zones and sand depletion. By their nature, such activities destroy habitats, may deeply affect biodiversity and can lead to a change in the composition of species.

With increasing environmental awareness, conflicts arise between supporters of economic development and the (social and natural) environment. To maintain a liveable world for more than three billion people who depend on marine and coastal biodiversity for their livelihood[1], **sustainable development of marine infrastructure** gains momentum. This implies balancing economic, environmental and social development. Environmental regulations have been put in place to reduce the impact resulting from construction. However, constructing marine infrastructure has even the potential to **add value**: new habitats for flora and fauna may be created based on for instance coral rehabilitation, or sheltered areas from sand and rock. The Zandmotor is a Dutch example of creating societal value by integrating a lagoon for recreational purpose into a design aimed at flood defence. For **marine contractors** operating in the sector that means that conducting sustainable business becomes central to value creation and to **distinguish themselves during tendering.**

Consequently, sustainability is integrated into contractor's strategy making. Though, its operationalization on project level remains fragmented, indicating an implementation gap. In view of that, transforming management practices to facilitate sustainable development may be **'the greatest challenge facing the Academy of Management'**[2], which remains present to date. A better understanding of the managerial decision-making is needed to define the critical success factors, which enable sustainability integration into projects. Thus, this research has the objective to:

> **design a success factor model for pro-actively integrating sustainability into projects of marine infrastructure contractors, focussing on the tender phase.**

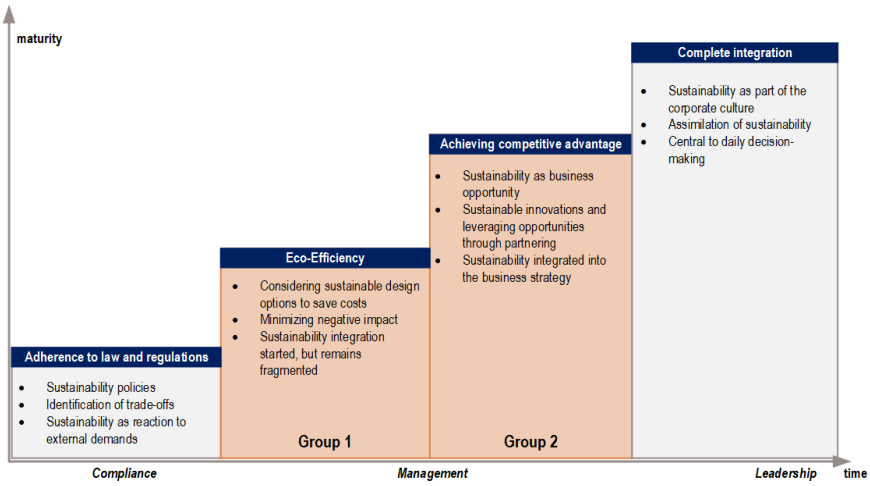
The research is conducted in the context of **Van Oord** (VO), an international marine contractor. Adhering to the norms of corporate social responsibility (MVO)[3], Van Oord thrives to pro-actively integrate sustainability into their business processes, going beyond the client's requirements. Still, also Van Oord experiences an implementation gap, which makes this an excellent research opportunity. Two phases are distinguished for the research process: exploration and synthesis.

Building the conceptual framework [Exploration]

The first research phase employed literature study and exploratory interviews to construct a conceptual framework as input for the success factor model synthesis of the second phase.

[1] Retrieved from: https://www.un.org/sustainabledevelopment/oceans/. 11.09.2019. 17:47.
[2] Gladwin et al., 1995
[3] MVO – maatschappelijk verantwoord ondernemen Dutch analogy to corporate social responsibility (more info see chapter 2)

The extent to which sustainability is integrated within an organization can be captured by the notion of **corporate sustainability maturity**. A maturity model tailored to this thesis was compiled, enabling an assessment of Van Oord based on empirical results. The levels are depicted in the figure below. Based on the maturity level reached, recommendations are derived to advance towards the next maturity level. Interviewee responses position Van Oord between eco-efficiency and achieving competitive advantage, indicating development potential until complete integration.



Next, two critical aspects, which impact sustainability integration were identified:

[a] **the context variables,** which reflect the contractor's potential sphere of influence, the latter decreases from internal (*organizational systems, programs, policies and strategies*), over the interface (*project environment*) to the external context (*local – and global operating environment, legislation and regulations*)

[b] **the organizational decision-making levels** which interdepend; they are: the strategic, - tactical and operational level; depending on the organizational function, responsibilities for success factors differ; knowing responsibilities helps to assign action holders, which supports workable change.

Then, **a list of 47 sub success factors** for pro-actively integrating sustainability was compiled. Next, a preliminary approach to apply the success factors was conceptualized to feed into the second phase.

The second research phase studied three marine infrastructure projects, which pro-actively integrated sustainability. This was to test the exploratory findings and *to synthesize the final success factor model*. Validity was supported by a comparison to theory and a focus group discussion with six practitioners.

The C^7 critical success factors and their implications to mature towards full integration [Synthesis]

Combining the case study results with the initial list of success factors led to the delineation of **seven critical success factors (C^7)** to which **37 sub-success factors** are assigned. The C^7 are: ***C**orporate leadership, **C**ompany culture, **C**ompany structure, Management **C**ontrol, **C**apabilities, **C**ollaboration* and *the (socio-economic) **C**ontext,* pertaining the following implications:

[1] consistent **corporate leadership** is needed to support the change management process, which is needed to fully integrate sustainability and to establish sustainability as an organizational success criterion to drive managerial decision-making accordingly

[2] a **sustainability centred culture** must overcome the industry specific *reactive* mindset; opportunity-based thinking emerged from this study and supports integration beyond the client's requirements, as it broadens the viewpoint beyond requirements (key to *pro-activeness*)

[3] a main development area constitutes the **decentralized company structure**, which must be overcome by proper integration and alignment between corporate – and project level

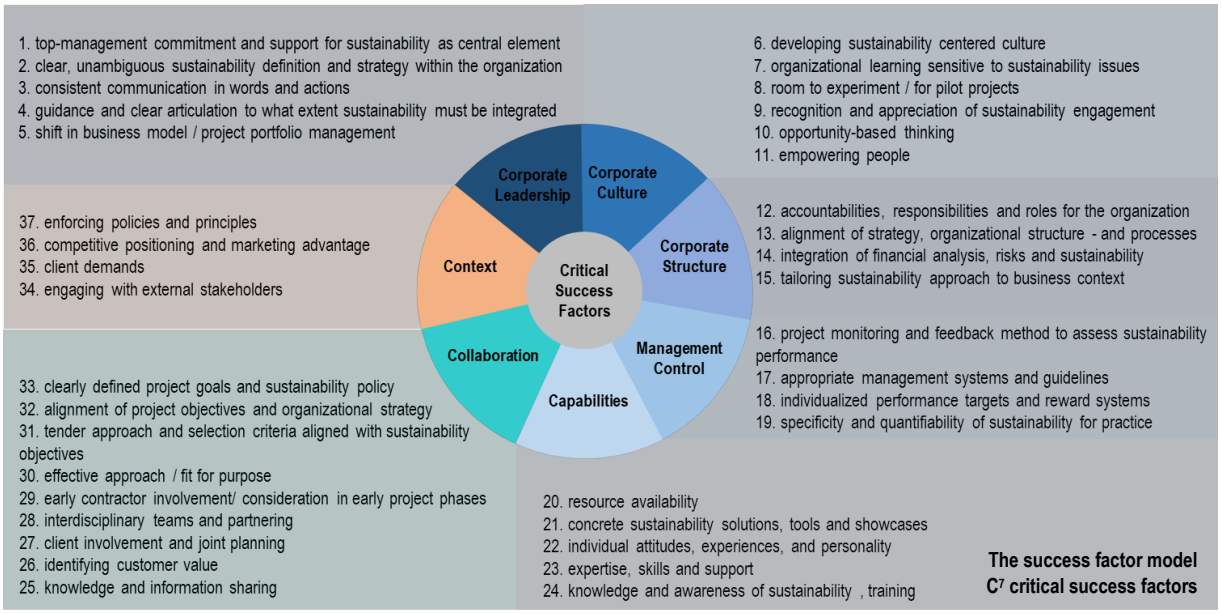
[4] **management control** supports integration, but traditional (static) approaches do not match the particularities and complexities of sustainability in marine infrastructure projects; they also clash with the bottom-up input; a corresponding approach needs to be designed

[5] integrating **capabilities** is vital for competitive advantage and to lessen the dependency on competencies of one distinct manager on project level; while they are well developed within Van Oord, they require assimilation on project level to ensure informed decision-making.

[6] for aligning internal strategy making with the external context **collaboration is** central; it is the binding link between the different contexts and of utmost importance for sharing information and integrating knowledge

[7] the **socio-economic context** constraints the contractor due to set requirements and demands, *but* it may also provide *a large opportunity to persuade the client of the added value* regarding sustainability integration, as most of his value drivers are allocated there.

The seven critical success factors were integrated into the C⁷ success factor model (depicted below).



Implications to effectively apply the C⁷ success factor model in practice

>> Managerial decision-making in projects considers the corporate, project and external context

Project management can only flourish strategic objectives, if receiving **corporate support**. In case of a mismatch between internal strategic- and client's objectives, tensions occur for managerial decision-making on project level. If this is not addressed internally , the likelihood of following the client's lead is high, as projects are delivered – and customized to the client's requirements. Then, a strong external orientation on client and stakeholder demands was observed. Opportunity-based thinking helps to match sustainability related scope to the client's external value drivers, which in turn creates value for him. As a result, the contractor can convince the client despite his role in the value chain.

>> All decision-making levels must contribute to change to enable sustainability integration on project level

This takes a **top-down and bottom up** approach. Bottom-up provides input into the strategy based on the required capabilities. Top down must promote change and follow up on sustainability to ensure its consideration beyond the client's requirements. The **middle management** on tactical level is critical to align strategy making and project level, hence to overcome possible fragmentation.

>> Conceptualizing the C⁷ implementation approach for practice

To help contractors to apply the success factors in practice, under consideration of the found implications, the C⁷ implementation approach was conceptualized and validated. This integrates the

success factors along the interdependent decision-making levels and the context variables, resulting in a matrix compilation. The approach helps practitioners to conduct a gap analysis and to subsequently derive actions for maturing towards full integration. Change is workable, because success factors are assigned action holders in line with decision-making levels. The prospect influence is reflected, which supports effective change and shows where the largest potential for impact is. The implementation approach can be found in the report and is **key for applying the factors in practice**.

Finally, concluding on the central research question to realize the study's objective:

"How could sustainability be pro-actively integrated into the daily decision-making during the tender phase of contractors, operating in the marine infrastructure sector?"

The study showed that to fully integrate sustainability, consistent fulfilment of the factors entailed in the success factor model is required. Conversely, the implementation gap relates to the non- (or inconsistent) fulfilment of those. Knowing this paths the way for complete integration. Moreover, the study demonstrated that to apply the factors in practice, managerial decision-making on project level is driven by the corporate, project and external context. Besides, to effectively integrate sustainability into projects, not only managers on project -, but also on corporate level have to enable success. The C^7 implementation approach was conceptualized for practitioners to make the success factors work.

The research contributes to theory and practice. For science, the critical strains in managerial decision-making on project level are unravelled, contributing to the ongoing discussion. For practice, the results enable to mature towards complete integration. Altogether, this study tackles the need of a systemic approach for sustainability implementation into operational practices, which was lacking in theory and practice. This helps to bridge the current implementation gap. Especially for **Van Oord**, the study delineated development areas and derived tailored actions to close the present gap. Action holders are assigned to missing factors, making the change process practicable. The sphere of influence helps to spot where the greatest direct impact can be made.

Recommendations and implications for future research and practice

>> For further research, it is recommended to *test the success factor mode*l qualitatively, or quantitatively in other contexts across the industry. Next, further *validating the conceptual C^7 implementation approach* is advised, as it is a new method based on the findings of this thesis. Particularly, a dedicated study regarding *the interdependent decision-making levels and its impact on managerial decision-making* could be fruitful. Research on *co-relation between success factors and a company's sustainability maturity* is suggested to proof prioritization over time.

Based on new insights, the following research opportunities are proposed: the impact of intergenerational collaboration to drive mindset change for a sustainability centred culture; the effect of diverse, multidisciplinary teams on sustainability in the early front-end and the design of an adaptive management control system for sustainability, accounting for the bottom-up approach.

>> For contractors it is recommended: **to take a top down and bottom up approach** for integrating sustainability into projects by safeguarding ownership and commitment of leaders, while integrating ideas and expertise from the bottom up; **to ensure, that the middle layer supports change** and facilitates the integration between strategy making and project level by aligning existing processes and practices; **to make sustainability a success criterion for organizational performance** to drive managerial decision-making accordingly (even if the client does not ask for it); **to apply opportunity-based thinking** to match the client's drivers with sustainable value propositions; **to assess the company's sustainability maturity** to spot development areas and to derive appropriate actions.

>> For clients, it is important **to involve contractors earlier** to benefit from their expertise and to avoid sub-optimal outcomes which do not meet the actual client's needs. Next, it is recommended to **align the tender approach** so that **collaboration** is possible and so that **value maximization** is safeguarded.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

NOMENCLATURE AND ABBREVIATIONS

Symbol	Description
BU	Business Unit
C&M	Communication & Markets
E&E	Engineering & Estimating
F&C	Finance & Control
FS	Facility Services
IT	Information Technology
L&C	Legal & Contracting
P&O	Personnel & Organisation
PM	Project Manager
PMP	Project Management Practices
PROC	Procurement
PROF	Project Office
QHSE	Quality, Health, Safety and the Environment
SDG	Sustainable Development Goals
SQi	Sub-Question i
SUR	Survey
TREA	Treasury
VO	Van Oord
VOMS	Van Oord Management System

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CHAPTER 1
INTRODUCTION

1. INTRODUCTION

To introduce the reader to this study, chapter 1 presents the research background (1.1), the problem statement (1.2) and the research design (1.3). The chapter ends with the outline of the thesis (1.4).

1.1 Background

Already back in 1970s, the *Club of Rome* concluded that the world would become unliveable for future generations, if population growth and industrialization keep up the same speed (Silvius, Schipper, & Planko, 2012). Despite this, today's industrialization can not only be observed on land, but also increasingly in the marine environment. The "industrialization of the ocean" accelerates (Kronfeld-Goharani, 2018) as sectors like offshore wind, deep water oil and gas as well as seabed mining emerge (Kronfeld-Goharani, 2018; OECD, 2016, p. 18). In addition, marine infrastructure like harbours, -artificial islands, and coastal defence structures are needed in response to increasing population and climate change. To construct all these assets, dredging is needed, which is relatable to large influence zones, sand depletion and severe environmental impacts, affecting habitats and riverbanks (Aarninkhof, Laboyrie, & van Koningsveld, 2018; Peduzzi, 2014; Ugwu & Haupt, 2007).

This threatens the preservation of the marine environment for future generations (Kronfeld-Goharani, 2018), on which presently more than three billion people depend for their livelihood[4]. Thus, economic development and the (social and natural) environment conflict. With increasing awareness, sustainable development gains momentum, which implies balancing economic, environmental and social development (GPM, 2015; Ugwu & Haupt, 2007). This results in global objectives such as the Sustainable Development Goals (SDGs) of the United Nations, but also in environmental legislation for the industry like the Environmental Impact Assessment (EIA).

Therefore, more sustainable practices are needed (GPM, 2015; Hahn, Pinkse, Preuss, & Figge, 2015; Ugwu & Haupt, 2007) and the dredging industry is transforming. Next to minimizing impact, the value adding function of marine infrastructure is increasingly recognized. Constructing marine infrastructure can for instance create habitats for flora and fauna by providing sheltered areas from rocks and sands, by rehabilitating coral reefs, or by nurturing existing flora like mangroves due to stimulating sediment supply. Also societal value can be created: The Zandmotor[5] protects the Dutch coastline from flooding, while providing areas for water sports and recreation.

As the 'productive driver[s]' of the industry, corporate organizations, like contractors, pertain a key role to achieve such sustainable development (Hahn, Pinkse, Preuss, & Figge, 2015). Moreover, their innovative power provides the opportunity to bring about change in the industry and to leverage long-lasting competitive advantage (Kramer & Porter, 2011; Zhang, Oo, & Lim, 2018). Accordingly, to distinguish themselves during tendering and to thrive for profit maximization, conducting

[4] Retrieved from: https://www.un.org/sustainabledevelopment/oceans/. 11.09.2019. 17:47.
[5] Retrieved from: https://www.dezandmotor.nl/en/the-sand-motor/introduction/. 05.09.2019. 11:23.

sustainable business becomes more and more important for contractors (R. Peenstra & Silvius, 2017, Tan et al., 2015). Responsible operations are no longer up for discussion, but are becoming central to value creation (Epstein, 2018). This results in corporate sustainability strategies (Peenstra & Silvius, 2017).

However, practically, there is a clear gap between strategy making and its actual consideration on project level (Wolfgang, 2017). Oftentimes, the success of integrating sustainability depends on the assigned manager on project level (Epstein, 2018; Silvius, Schipper, & Visser, 2017; van Walt Meijer, 2018), or on the client's willingness to pay for sustainability (Peenstra & Silvius, 2018), resulting in fragmented integration.

Present implementation approaches fail to reach all organizational levels of the company (Epstein, 2018). The consideration of sustainability is neither integrated in managerial decision-making (Silvius, Kampinga, Paniagua, & Mooi, 2017), nor are the complexities of managerial decision-making for integrating sustainability well understood (Sabini et al., 2019). For marine contractors, further challenges arise given their role in the value chain and decentralized decision-making (Dubois & Gadde, 2002; Eriksson, Leiringer, & Szentes, 2017; Larsson & Larsson, 2018). At present, research on the perspective of the contractor is scarce (see table 17). Considering this, the problem statement of the study is formulated in the subsequent section.

1.2 Problem Statement

The problem addressed by this study is the gap between strategy making and integration of sustainability on project level for contracting organizations.

Integrated approaches for sustainability implementation into practice are lacking

At present integrated approaches for sustainability implementation into practice are lacking (Epstein, 2018) and there is no systemic approach, how sustainability can be successfully integrated into projects (Sabini, Muzio, & Alderman, 2019). Although most papers, studying sustainability in projects, provide managerial implications, their highly contextual conclusions can hardly be applied to other projects (Sabini et al., 2019). Therefore, sustainability integration remains fragmented and strongly correlates with the assigned project manager in charge of the project (van Walt Meijer, 2018; Wolfgang, 2017).

The tensions, managers face regarding sustainability integration into projects are not yet well understood

A stronger focus on the decision-making would help to unravel the tensions, that managers face when integrating sustainability into projects, hence contributing to the scientific discussion around sustainability in projects (Sabini et al., 2019). Especially the perspective of the contractor is largely unexplored, so that next to the manager's individual motivation, only the client's willingness to pay has been found to trigger sustainability integration (Peenstra & Silvius, 2018).

Thus, to successfully integrate sustainability throughout the organization – and thus on project level, the factors to successfully bridge the implementation gap must be defined, - and channelled into a practical approach. Subsequently, sustainability may become fully integrated and hence, integral to competing and profit maximization.

1.3 Research Design

This section presents the research design. First, the *research objective* is defined (1.3.1). Then, the research questions to materialize the objective are presented (1.3.2). Last, the research scope – and context are delineated (1.3.3).

1.3.1 Research Objective

To approach the research problem, a research objective is drawn up. The objective of this research is:

> **to design a success factor model for pro-actively integrating sustainability into projects of marine infrastructure contractors, focussing on the tender phase.**

The focus is on tendering, because this is the distinctive phase for a contractor, where he has to sell his capabilities. Besides, the opportunities to effectively integrate sustainability are largest at start, before contract award. On the other hand, cost efficiency is still promoted by many clients, which challenges pro-active sustainability integration. The importance of tendering is further highlighted – and explained in chapter 2 and 4.

The contribution of realizing this objective is twofold: First, this research adds to the present **theoretical body of knowledge**. At present, there is little research on the contractor's perspective for integrating sustainability – and none known to the author, which addresses (marine) infrastructure projects. A keyword search has been conducted accordingly (see appendix A-I). Furthermore, systemic approaches for the integration of sustainability on project level are lacking, so that the tensions managers face in their decision-making are not yet well understood (Sabini et al., 2019). Especially, combining the corporate view with project management for sustainability seems not addressed.

Second, **for practice** such a success factor model is relevant as there is currently a lack of comprehensive approaches. Besides, managerial implications from existing studies are highly contextual, so that their applicability to other contexts is limited. While the success factor model of this study is designed within the marine infrastructure sector, its intention is to deliver multiple levels of abstraction, so that it can be transferred and used in other circumstances as well.

1.3.2 Research Questions

Given the research objective, the research questions are formulated. Suitably, the central question is:

> **CQ** **How could sustainability be pro-actively integrated into the daily decision-making during the tender phase of contractors, operating in the marine infrastructure sector?**

This research questions triggers the development of a structured set of recommendations regarding the success factors for pro-actively implementing sustainability. To answer this overarching research question, four sub-questions are derived. The first sub-question is:

> **SQ1** **What are the relevant aspects to take into account for pro-actively implementing sustainability strategies?**

This sub-question conceptualizes sustainability in organizational context. Next to a definition, this includes the investigation of the different organizational decision-making levels to see, how these interdepend. Furthermore, the contextual factors are considered, which have to be taken into account,

if the sustainability strategy shall be integrated at all levels within the organization. Based on the outcome of SQ1, implications for the application of the success factors are derived.

To also understand the causes for the disparity between strategy making and integration on operational level, a gap analysis is required. As a result, appropriate response strategies can be formulated. Therefore, the second sub-question is:

SQ2 What are the causes for the gap between strategy making - and its integration on project level?

Based on initial research (literature study and exploratory interviews), implications for organizations of the marine construction sector are presented. This requires an understanding of sector specific traits, which impact decision-making in tenders. The challenges regarding the contractor's role in the value chain are explored, including its effect on pro-actively integrating sustainability.

To close the gap, knowing the success factors for pro-actively integrating sustainability is essential for designing a corresponding model. This is addressed by the third research question:

SQ3 What are the success factors to pro-actively integrate sustainability in the tender phase?

This question studies the success factors for pro-actively integrating sustainability in marine infrastructure projects. For this sub-question empirical evidence is required to add on findings from initial research. The success factors are critical input of the success factor model.

To apply the factors in practice, the fourth research question analyses empirical evidence and conceptualizes and implementation approach. Therefore, the last sub-research question is:

SQ4 How could a model capturing such success factors be applied in practice?

Based on answering the fourth research question, the success factors shall become operationalizable for contracting organizations. Thus, next to building up theory, the study constitutes a practice-oriented research.

In depth information regarding the research approach and methods is provided in chapter 3. To design a realistic research framework, scoping is essential (Verschuren, Doorewaard, & Mellion, 2010). This is presented in the subsequent section.

1.3.3 Research Scope and Context

Several considerations are made in view of scope – and context:

[1] Given the contribution of marine infrastructure to the "industrialization of the ocean" paired with the lack of related research, the study explores the integration of sustainability in **marine infrastructure projects.** The focus thereby is on projects entailing **dredging scope**, as this constitutes a high impact activity, and features a sector which presently thrives towards more sustainable practices (see 2.3.2)

[2] The perspective of a **marine contractor** is taken. This is due to his high potential to drive change. Besides, contractors increasingly thrive for value creation through sustainability to distinguish themselves. This results in the adaptation of corporate strategies accordingly, so that contractors are faced with the explained integration challenge between strategy making and project level.

[3] The study is limited to the project management during **tendering**. In that phase, contractors have to achieve marketing advantage, while being faced with the challenge to deliver cost-efficient proposals tailored to the client's needs. This phase is exceptionally well suited to be pro-active as the requirements are being defined and the design alternative is chosen.

For this research Van Oord, an internationally operating marine contractor, will provide empirical evidence and serve as case study. The corresponding research context is introduced hereafter.

Company Profile – Introducing Van Oord

Van Oord is a Dutch, family-owned company with more than 150-years of experience (van Oord, 2018). In 2018, 190 projects were executed in 46 countries worldwide, employing 4.954 people of 74 nationalities (van Oord, 2018). The company's vision is "*to create a better world for future generations by delivering marine ingenuity*" (van Oord, 2018, p. 6), with ingenuity being defined as "*the quality of being clever, original, and inventive*"[6]. The focus areas include dredging, oil and gas infrastructure as well as offshore wind. This vision is triggered by four market drivers, namely:

- **urbanization**, due to the growing need for more space;
- **maritime transport**, which requires new -and better infrastructure;
- **climate change**, which triggers the need for climate adaptation strategies, and
- **the growing demand for energy**, which inclines a shift towards renewable alternatives.

The business strategy is defined along four core values, which are **we create** (innovative maritime solutions), **we care** (about people, quality and safety), **we work together** (in close collaboration and with clients) and **we succeed** (by continuously improving and remaining competitive) (van Oord, 2018, p. 6). This already indicates the relevance of sustainability to Van Oord's business activities. Suitably, Van Oord has made an attempt towards sustainable development, formulating strategic goals and initiatives on corporate level for contributing to sustainable development. Yet, this strategy can only be effective, if it reaches all organizational levels. This implementation process has not yet been fully realized. Therefore, Van Oord provides an excellent opportunity to explore the necessary factors for considering sustainability in marine infrastructure projects. A thorough review of the organization and its corporate sustainability strategy takes place in section 4.1.1. To end this chapter, section 1.4 provides an overview of the thesis structure – and deliverables.

1.4 Thesis Outline

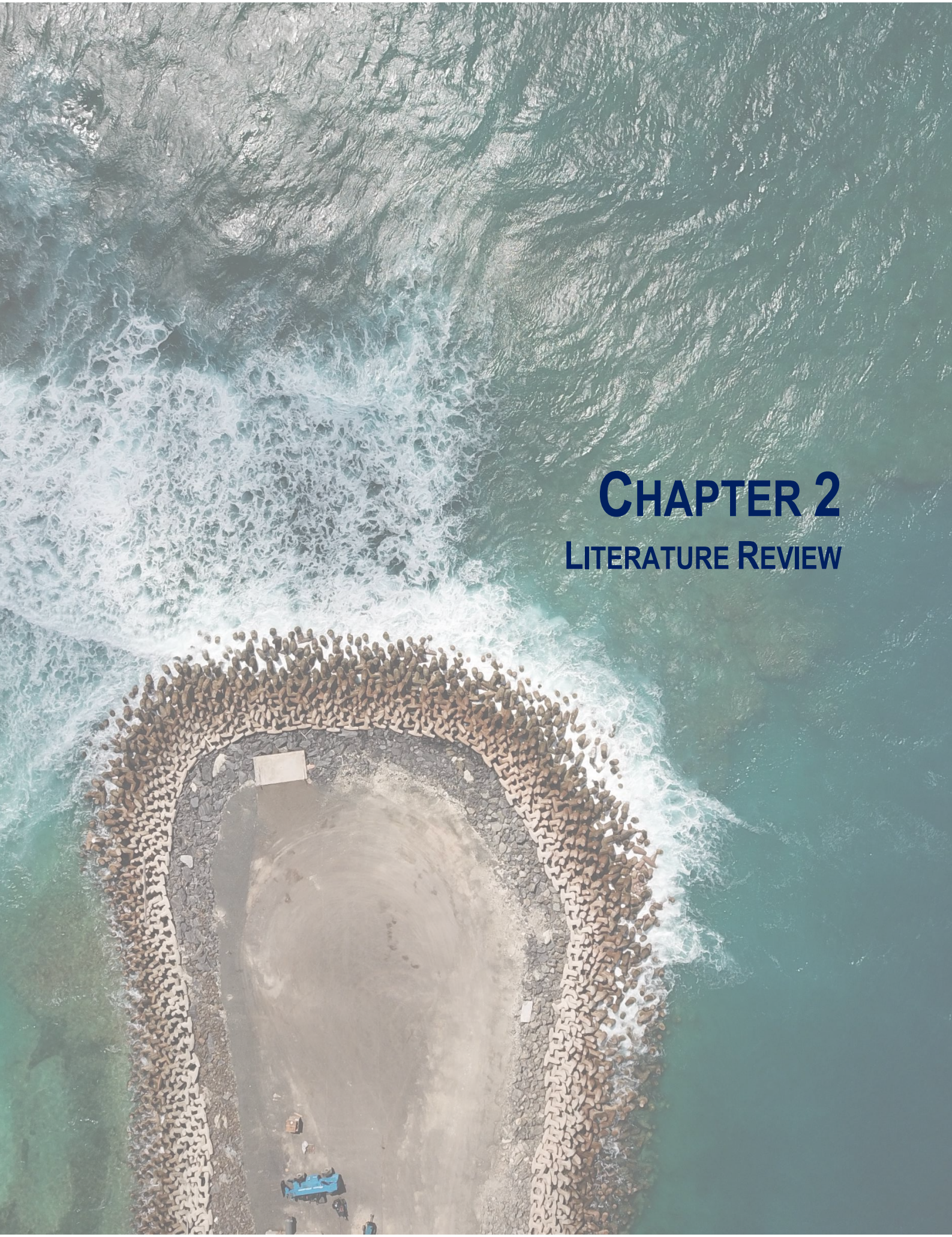
The research objective is realized in subsequent steps. **The first research phase** builds the conceptual framework of the thesis based on a literature study (chapter 2), the research methodology (chapter 3) and a company review, including exploratory interviews (chapter 4). Outcome of the first research phase is a preliminary implementation approach, which integrates the success factors found.

The second research phase collects empirical evidence to validate the conceptual framework. The preliminary findings are tested based on case studies (chapter 5). Then, *the success factor model is synthesized* and validated against theory – and an expert panel discussion (chapter 6). Besides, an implementation approach for practice is suggested. Chapter 7 concludes on the study and answers the central research question. Figure 1 depicts the thesis outline.

	I. Introducing the Research	II. Research Phase 1 – Exploration	III. Research Phase 2 – Synthesis	IV. Concluding on the Research
Input	**CH 1** Introduction	**CH 2** Literature Review **CH 3** Research Methodology **CH 4** Company Review & Exploratory Interviews	**CH 5** Case Studies **CH 6** C7 Model Synthesis and Discussion	**CH 7** Conclusions and Recommendations
Output	**Background and Context**	**Preliminary Success Factor List** **Preliminary Implementation Approach**	**C7 Success Factor Model** **Conceptual Implementation Approach**	**Concluding on Research Objective**

Figure 1: Thesis Outline [own illustration]

[6] Oxford dictionary. https://en.oxforddictionaries.com/definition/ingenuity. Retrieved on 05.03.2019, 15:16.



CHAPTER 2
LITERATURE REVIEW

2. LITERATURE REVIEW

This chapter presents the results of the literature review. The outcome of **this chapter provides the theoretical input for the conceptual framework** to be tested based on empirical evidence:

SQ1 *What are the relevant aspects to take into account for implementing sustainability strategies?*

SQ2 *What are the causes for the gap between strategy making - and its integration on project level?*

SQ3 *What are the success factor to pro-actively integrate sustainability in the tender phase?*

This chapter is structured as follows: To enable answering SQ1, the concept of sustainability is explored and contextualized for corporate organizations (2.1, 2.2). Section 2.3 addresses SQ1 by looking at managerial decision-making in project based organizations. Additionally, section 2.3 introduces the construction industry with a focus on the marine infrastructure sector. As a result, potential barriers and implications are derived, which delineate the causes for the present implementation gap (SQ2). Section 2.4 presents sustainability as a project success criterion and reviews success factors for sustainability implementation in corporate – as well as in project context (SQ3). **Critical output** of this chapter is a preliminary list of success factors based on theory, which will serve as input for the conceptual framework of this research (see chapter 4).

2.1 Exploring the Concept of Sustainability

With the ongoing industrialization, leading to significant resource depletion, the start of the need for "sustainable development" was marked (Silvius et al., 2012). Already in the 1970s, with the launch of "Limits to Growth" the Club of Rome advanced this discussion to a global scale (Silvius et al., 2012). In this, it was concluded, that if population growth and industrialization keep up the same speed, resources would be exhausted, resulting in an unliveable world for future generations (Silvius et al., 2012). This triggered global reactions, leading to the establishment of the United Nation's (UN) '*World Commission on Development and Environment*' (Silvius et al., 2012), which with the Brundtland report defined:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[7]

In reaction to the Brundtland report, governments integrated sustainable development into their political programs. The first action-plan to achieve global sustainable development is associated with the Agenda 21, as a result of the UN conference on Environment & Development in 1992.[8] Later, the World Summit on Sustainable Development (Johannesburg, 2002) declared a concrete implementation plan[9].

Throughout its historical journey, sustainability has been interpreted in numerous ways (Silvius et al., 2012). Though, the common notion is in line with the Brundtland definition, that is to generate prosperity without compromising the future under consideration of the triple bottom line of the

[7] http://www.un-documents.net/ocf-02.htm#I. Retrieved: 17.05.2019, 14:07.
[8] https://sustainabledevelopment.un.org/milestones/unced. Retrieved: 17.05.2019, 14:30
[9] https://sustainabledevelopment.un.org/sdgs. Retrieved: 17.05.2019, 14:16.

social (people), ecologic (planet) and economic (prosperity) dimension of development (Silvius et al., 2012).

The more recent sustainable development goals, stemming from the 2030 Agenda for Sustainable Development, concretize global sustainability objectives[9] and stimulate actions on critical areas for humanity and the planet, adding peace and partnership to the triple bottom line. Figure 2 indicates these goals.

Figure 2: Sustainable Development Goals [Retrieved from https://sustainabledevelopment.un.org/sdgs. 01-07-2019. 11:36]

To concretize the characteristics and implications of pursuing sustainable actions, sustainability has been defined by Silvius and Schipper (2014) along 11 dimensions, which are summarized in table 1. These serve as indicators for sustainable awareness – and actions.

Table 1: Sustainability dimensions adapted from Silvius & Schipper (2014)

No.	Dimension	Implications
[1]	Time	Recognizing the tension between short -and long term effects
[2]	Space	Consideration of local and global effects
[3]	Value	Sustainability as a normative value, making it a desirable outcome
[4]	Performance	Ineffectiveness, inefficiency and failure seen as waste of resources
[5]	Participation	Inclusiveness regarding stakeholder participation
[6]	Waste Reduction	Reduction – and prevention of waste generation
[7]	Transparency	Informing stakeholders in a pro-active and open manner
[8]	Accountability	Willingness and availability to be held accountable for decisions
[9]	Cultural	Respect towards cultural differences
[10]	Risk	Taking a risk-based approach aimed at minimization and mitigation
[11]	Political	Accounting for different stakeholder interests

For sustainable development, corporate organizations, as the 'productive driver' play a key role (Hahn, 2015). Furthermore, as the trigger of ongoing industrialization, they bear main responsibility to ensure sustainable development. With increasing sustainability awareness, firms are forced to integrate sustainability concerns into their corporate strategy (Peenstra & Silvius, 2017). Therefore, the following section 2.2 introduces sustainability in the context of corporate organizations.

2.2 Organizational Development for Sustainability

For a firm to be considered sustainable, the achieved business performance – and outcome should be aligned with the triple bottom line of people, planet and prosperity (Afzal, Lim, & Prasad, 2017). In the context of organizations, sustainable development is usually associated with Corporate Social Responsibility (CSR), which is defined by the ISO 26000 (p.3) as:

"responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behaviour, that contributes to sustainable development, including health and the welfare of society; takes into account the expectations of stakeholders; is in compliance with applicable law and consistent with international norms of behaviour; is integrated throughout the organization and practiced in its relationships"

CSR in the Dutch context is captured by *Maatschappelijk Verantwoord Ondernemen* (MVO), which is a network of partnering organizations that commit to CSR[10]. MVO goes further towards an integrative approach as defined by Hahn et al. (2015), which entails the combination of acquiring profit from social and environmental activities, whilst adding value to society.

The ensuing implementation of sustainability, requires organizations to change including "*to create a new agenda, innovate and adapt their businesses, and [to] integrate new business priorities.*" (Machado, de Lima, da Costa, Angelis, & Mattioda, 2017, p. 4). To leverage the expected pay-offs, it is critical for the organization to tailor its sustainability strategy according to the characteristic needs - and the operating context (Engert & Baumgartner, 2016; Epstein, 2018; Silvius & Schipper, 2014). The organizational context may vary per geographical area, leading to differing environmental requirements -and stakeholder expectations (Epstein, 2018). For a successful sustainability implementation approach, Epstein (2018) suggests the consideration of the external-, -business, -and internal context as well as human and financial capabilities.

- The **external context** entails the local – and global operating environment as well as the relevant legislation and regulatory requirements; this grants the license to operate
- The **business context** relates to the industry, or sector the firm operates in, to the customer and to the type of product
- The **internal context** links to organizational systems, programs, policies and strategies that enable sustainability performance.
- The **human and financial resources** summarize the constraints of a firm regarding the capabilities of sustainability programs and the ability to pay – and train staff concerned with sustainability.

Depending on the contextual variable, the sphere of influence available for the company varies. The sphere of influence here refers to the:

"[…] extent of political, contractual, economic or other relationships through which an organization has the ability to affect decisions or activities of individuals or organizations." (ISO, 2010, p.4).

[10]Retrieved from: https://www.duurzaam-ondernemen.nl/info/wat-is-mvo/. 11.-0.2019. 15:36.

Companies can exert more influence on variables, which are internal to their organization – and which depend to a lesser degree on external input as they have more control over such activities.

The sphere of influence is considered particularly important, because the contractor largely depends on the (external) client's requirements, which to date challenges implementation.

In view of the context variables, which are firm specific, the claim to define the value of sustainability in line with the organization's vision -and mission (Sroufe, 2017) becomes even more important. This is also why this thesis requires to define corporate pro-active sustainability in practice of the marine infrastructure sector.

In context of *organizational change*, implementation processes distinguish different maturity stages. The concept of such maturity models is presented in the subsequent section.

2.2.1 The Corporate Sustainability Maturity Model

To assess the degree of sustainability within organizations, the concept of the Capability Maturity Model based on the Software Engineering Institute (SEI) (Paulk, Weber, Curtis, & Chrissis, 1995) has been widely used. This is because the extent to which sustainability is integrated differs greatly amongst firms (Silvius et al., 2012).

According to capability maturity models, an organization approaches maturity, whenever all participants grasp the value of the desired processes, and the necessary support infrastructure is provided (Paulk et al., 1995). This resembles an organizational culture as defined by Schein (2004, p. 17) including:

> "*[a] pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems*".

To assemble a maturity model tailored to this thesis, four maturity models have been selected and compared. The selection of literature relates to the fact that the corporate view as well as the project lens shall be considered. Moreover, a reference from operations management is included, because it has a strong focus on productivity, which is relevant in the context of dredging too.

The key stages identified by Epstein (2018), Machado et al. (2017), Silvius et al. (2012) and Wetzel (2016) are summarized in table 2. Reviewing the content of the maturity models as proposed by Epstein (2018), Machado et al. (2017), Silvius et al. (2012) and Wetzel (2016) shows major alignment. The maturity ranges from compliance to assimilation of sustainability. The perception changes from sustainability being an external requirement towards sustainability as a business enabler, that should be pro-actively realized by all members within the organization during daily decision-making.

The insights of the maturity models from literature will be used upon assembling a framework model for sustainability implementation. This is because a sustainability model tailored to this thesis will be synthesised, in order to reflect the staged pathway towards full sustainability integration into daily decision-making.

Furthermore, achieving sustainable organizations entails the consideration of the different, interdependent decision-making levels (Hahn et al., 2015). Therefore, the subsequent section takes a closer look at the organizational structure of *project-based organizations and its implications on decision-making*.

Table 2: Overview of key stages - and characteristics of selected sustainability maturity models

Stage	Corporate View Epstein (2018)	Corporate View Wetzels (2016)	Operations View Machado et al. (2017)	Project-Based View Silvius et al. (2012)
1	**Managing regulatory compliance** • start recognizing responsibility and financial implications of the social and environmental dimension • a policy document and corporate strategy are formulated • meeting present guidelines and laws as well as minimizing their sustainability impact	**Optimize** • compliance level • external pressure leads to sustainability considerations to legitimize operations	**Compliance and conformity** • defining sustainability policies • compliance with external laws and regulations • identification of fundamental trade-offs within the supply chain	**Compliance** • reacting to increasing regulations and stakeholder demands • start to achieve compliance in order to obtain license to operate
2		**Improve** • cautious adopters of sustainability • embracing potential opportunities laying within sustainability	**Operations eco-efficiency** • reducing impact and increasing efficiency as well as productivity • defining sustainability requirements for the supply chain	**Beyond compliance** • shift from a reactive to a proactive approach towards sustainability • yet, having limited effects throughout the various departments
3	**Achieving competitive advantage** • move form compliance to exploring business opportunities • use of sustainability as differentiator • focus on cost-avoidance by i.e. considering life cycle performance	**Change** • creating responsible organizations • designing a new business model • achieving competitive advantage • introducing change towards new practices	**Sustainability management system** • structures and processes are in place to guide sustainability • enabling sustainable business gains • leveraging opportunities by including the supply chain and new types of collaborations	**Integrated strategy** • fully integrates sustainability into the business strategy • sustainability is now a business enabler • sustainable innovation transforms company
4			**Network and stakeholder integration** • sustainability as key strategy with established CSR principles • full consideration of sustainability aspects along the value chain • knowledge sharing amongst the supplier network • eco-efficient designs and life-cycle approach	
5	**Completing sustainability integration** • full integration of sustainability into daily business decision-making • characterized by pro-activity and investment into long-term profitability • sustainability generates profit	**Renewal** • transition management to fully integrate sustainability • sustainability fully integrated • intrinsic motivation for sustainability	**Sustainable operations integration** • sustainability as part of a new business model • sustainability is fully integrated through change management and process improvement	**Purpose and Passion** • internalization of sustainability • any corporate action is driven by intrinsic motivation to contribute to sustainable development

2.3 Sustainability Implementation in Marine Infrastructure Construction

Contractors operating in the marine infrastructure sector, are project-based organizations, which has implications for integrating a sustainability strategy. First, a brief introduction into managerial decision-making is provided (2.3.1). Then, sustainable development in the marine infrastructure sector is presented (2.3.2), followed by the boundary conditions in a contractor's view (2.3.3). Last, barriers to integrate sustainability are delineated (2.3.4).

2.3.1 Marine Contractors - Introducing Project-Based Organizations

To start with, a project is considered unique (non-routine), has a temporary character, including a defined start – and end date, and must be appropriately managed to meet the intended objectives (PMI, 2019).

To create corporate value by the means of projects necessitates the alignment of the projects undertaken - with the overall strategy maintained by the organization (Too & Weaver, 2014). This must be ensured upon project approval – and initiation, whereby value is understood as:

"*explicit and implicit functions created by the project, which can satisfy the explicit and implicit needs of stakeholders*" *(Too & Weaver, 2014, p. 1383).*

Consequently, if the corporate strategy aims at pro-actively integrating sustainability, projects should be carefully selected in line with these intended strategic objectives in addition to present resources and capabilities. Therefore, the **project selection** phase largely determines the opportunities for sustainability integration.

For aligning project's objectives with the intended strategy, senior and middle management take the responsibility by selecting the projects accordingly (Too & Weaver, 2014). For managerial decision making in project-based organizations, three layers of decision-making can be distinguished (Too & Weaver, 2014):

[1] **the strategic level**, which is responsible for leading the company including prospect future pathways, strategic discussions and long-term objectives (top-management);
[2] **the tactical level**, which is considered the management of project management, implementing the intended corporate objectives by setting appropriate process agendas (executive – and senior management) and determining the portfolio;
[3] **the operational level**, which executes the work at project level, realizes suggested changes and experiments in the boundaries prescribed by upper levels (project – and tender management).

The tactical level is in charge of the management system, including a central project management office (PMO) and constitutes the link between strategy making and operations (Too & Weaver, 2014). Management on project level is controlling the realization of the organization's outputs as efficiently as possible (Too & Weaver, 2014). This suggests, that the decisions in projects depend not only on the manager on project level, but also on the tactical level. Thus, managerial decision-making is interdependent.

Figure 3 indicates these interdependencies. A **top-down** approach regarding strategy implementation and the governance framework is denoted, but also a **bottom-up** approach can be seen, as the project level provides feedback via tactical management to the strategy formulation based on their expertise and insight from project level.

Due to this, this thesis examines in which way sustainability related activities – and decisions differ depending on the organizational level. Hence, for designing the success factor model, it is suggested to make use of a *transition model under separation of the different corporate levels*. Transition models bridge the gap between top-down and bottom-up change processes using different levels of governance, thereby aligning interaction between the different levels, so that these reinforce each other (Frantzeskaki, Loorbach, & Meadowcroft, 2012).

The interdependency between different decision-making levels suggests the allocation of success accordingly. To further delineate the context of marine infrastructure, the following section introduces the implications stemming from the industry – and the perspective of the contractor in particular.

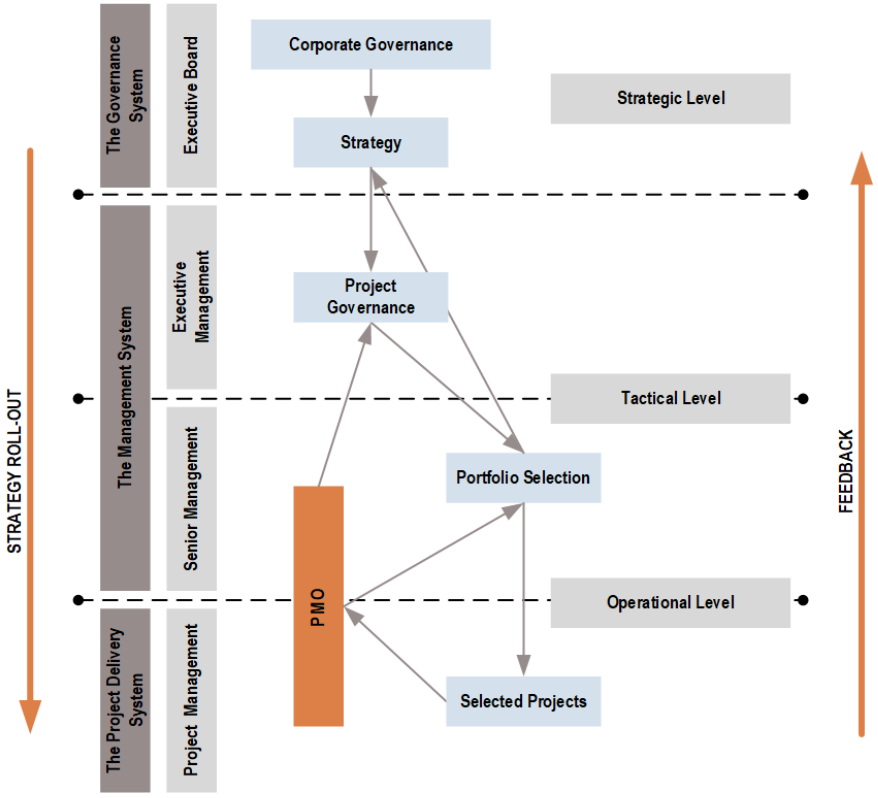


Figure 3: project governance framework and decision-making levels [own illustration, adapted after Too & Weaver (2014)

2.3.2 Sustainability in the Marine Infrastructure Sector

Dredging is needed to support construction for presently emerging markets such as offshore wind, deep water oil and gas exploitation as well as seabed mining. Other scopes for dredging of marine infrastructure includes harbors, artificial islands, or coastal defense structures.

Dredging has severe environmental impacts, large influence zones and considerably contribute to the depletion of sand (Aarninkhof et al., 2018; Peduzzi, 2014, p. 1; Ugwu & Haupt, 2007). By their nature, such activities destroy habitats, may deeply affect biodiversity and can lead to a change in the composition of species (Peduzzi, 2014). Besides, changes in water turbidity due to sand excavation can affect the natural environment and riverbanks (Aarninkhof et al., 2018; Peduzzi, 2014).

As "*more than three billion people depend on marine and coastal biodiversity for their livelihood*[11]*"* and with increasing environmental awareness, fundamental conflicts arise regarding dredging projects between supporters of economic development and the environment. In response to that and to minimize negative impact of dredging activities, a vast range of environmental regulations has been put into place such as the environmental impact assessment (EIA).

Also across the industry change can be observed. The *United States Army Corps of Engineering* (USACE) and their *Environmental Operating Principles* provide an example of increasing sustainability awareness in the sector. This includes promoting sustainability as a corporate culture, proactively

[11] Retrieved from: https://www.un.org/sustainabledevelopment/oceans/. 11.09.2019. 17:47.

considering potential impacts, and creating sustainable solutions, while applying a risk-based approach throughout the project life cycle (Aarninkhof et al., 2018, p. 7).

The *Central Dredging Association* (CEDA) and the *International Association of Dredging Companies* (IADC) define sustainability in context of marine infrastructure as:

> *"Sustainability is achieved in the development of infrastructure by efficiently investing the resources needed to support the desired social, environmental and economic services generated by infrastructure for the benefit of current and future generations" (Aarninkhof et al., 2018, p. 10)*

The sustainable design – and construction of marine infrastructure must thus consider the project outcomes (costs, values) across the three pillars of sustainability.

A similar approach has been taken in the built environment sector, where a fourth P reflects the project in the context of sustainable development (Van Dorst & Duijvestein, 2004). The sustainability pillars are bound together and support the project with its unique goals (see figure 4). The top objective cannot be realized without the bottom qualities (Van Dorst & Duijvestein, 2004).

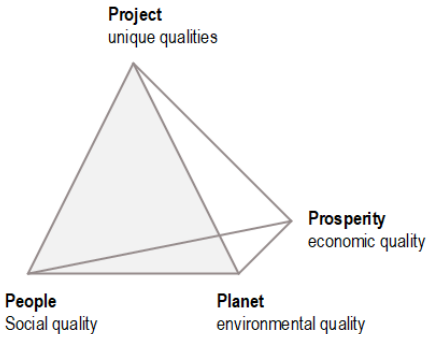


Figure 4: The 4th P [own illustration, after Van Dorst & Duijvestein (2004)]

On corporate level, sustainability is increasingly addressed for instance by corporate responsibility. Benchmarking is used to compare the various organizations in the maritime construction sector regarding their sustainability performance. An example is the Dutch "transparentiebenchmark" based on the Dutch *Ministry of Economic Affairs and Climate Policy* .

In view of that, *dredging more sustainable marine infrastructure* implies minimizing negative impact on the ecosystem. This can be achieved by adapting methods and equipment to reduce turbidity and maintain water quality, but also by minimizing reef crossing, or shifting to alternative fuels for the dredgers. Dredging more sustainably can even go further and bears the potential of social, environmental and economic benefits.

For instance, the Dutch EcoShape programme takes the natural system as the starting point and strives for a design that is not only safe and sound but also inhibits habitat development for flora – and fauna. Furthermore, based on stakeholder engagement societal values can be integrated (i.e. recreational value)[12]. For the natural environment, reef rehabilitation is a recent example of a value adding measure.

However, especially in view of the contractor, sustainability integration is challenged by the way the industry operates, which is explained in the subsequent section 2.3.3.

2.3.3 Boundary Conditions for Contractors to implement Sustainability

In *marine infrastructure construction*, projects are delivered customized to the *client's* requirements with decentralized decision-making (Dubois & Gadde, 2002; Eriksson et al., 2017). For contractors, such projects are a great means to realize organizational objectives and to bring about change (Silvius et al., 2012). This is because each phase of a project entails a particular scope, which has the potential to trigger sustainability considerations to add value (Aarninkhof et al., 2018, p. 19).

[12] Retrieved from: https://www.ecoshape.org/en/the-building-with-nature-philosophy/. 05.09.2019. 16:00.

Figure 5 depicts the project life cycle in abstract terms, entailing project initiation **[1]**, project planning – and organization **[2]**, project execution **[3]** and project closing **[4]** (PMI, 2017b).

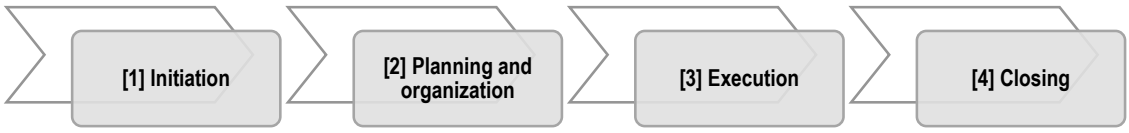


Figure 5: Schematic Overview of Project Lifecycle [own illustration]

If the contractor is responsible for part of the design, he assumes a central role in implementing sustainability, because it is the individual engineer, or the designing team, that emphasizes the distinct design aspects (Jonker & Harmsen, 2012). Additionally, it is the contractor's task to carry out the actual scope of work (Zhang et al., 2018).

Considering this, the *early project phases* are central for incorporating sustainability, as different solutions are considered for the problem to be solved (Aarninkhof et al., 2018). A sustainable design entails additional and different design requirements compared to business as usual (Jonker & Harmsen, 2012). Therefore, early in the process, the design solution can be optimized towards a more sustainable attempt at relatively low costs (Aarninkhof et al., 2018, p. 19). Figure 6 depicts the reduced degree of freedom during consecutive stages of project development (adapted after Aarninkhof et al. 2018, p.19).

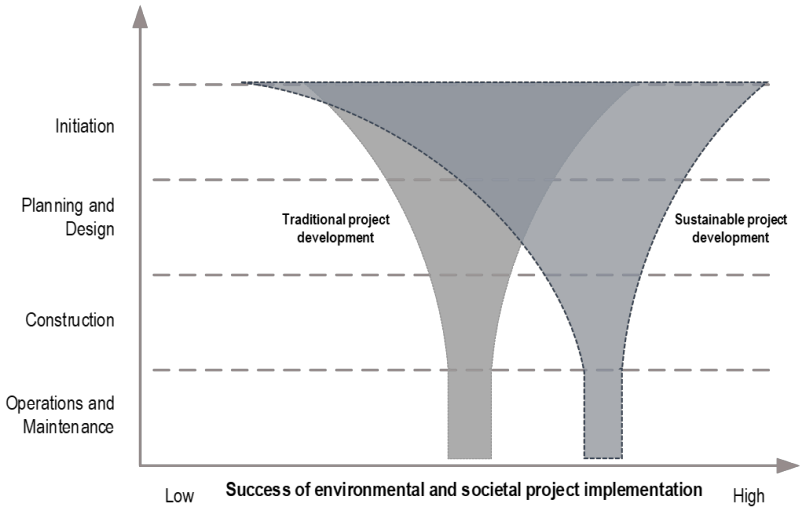


Figure 6: Reducing degree of freedom during the consecutive project development stages [own illustration, adapted after Aarninkhof (2018, p.19)]

However, contractors oftentimes enter too late in the project life cycle, so that negative impacts and sustainability are considered at the late design stage, or when construction has started (Aarninkhof et al., 2018, p. 1).

In most cases, the client initiates the project and provides the design specifications – as well as financial resources (Larsson & Larsson, 2018). So, relatively little room exists for the contractor as he merely reacts upon provision of the tender documents, which prescribe the steps to be taken (Eriksson et al., 2017). At that time, key decisions have been made, and the flexibility to change the project are low (Aarninkhof et al., 2018, p. 19). As a result, surrounding stakeholders are presented with a fait accompli, which in turn results in frequent opposition, and subsequently threatens successful project delivery (Aarninkhof et al., 2018, p. 1).

This suggests, that the highest potential for the contractor to effectively integrate sustainability lays in the *early project phases*. It is especially **the tender phase** that is distinctive for a contractor. This is because a successful tender results in a contract, ensuring business continuity – and profitability. This phase is extremely competitive, as usually multiple parties bid for the same job and the contractor therefore has to profile himself and sell his capabilities. For that, cost-competitiveness remains a major driver, as clients intend to promote efficiency by rewarding the lowest possible price amongst the participating bidders (Dubois & Gadde, 2002; Eriksson et al., 2017).

Though, to obtain **real competitive advantage**, a company's strategy should entail more than offering the lowest price (Kramer & Porter, 2011). Instead firms should strategically define their exclusive business values, which distinguish them from their competitors (Kramer & Porter, 2011). Implementing sustainability on one's own initiative (pro-active) can be such a differentiator in the bidding process, and is thus a great business opportunity for contractors (R. Peenstra & Silvius, 2017, Tan et al., 2015).

Throughout the bidding process, it is the assigned project manager for the tender phase (tender manager), who has to deliver efficient – and effective projects by applying the appropriate

"[…] knowledge, skills, tools, and techniques to project activities to meet the project requirements."
(PMI, 2017b, p. 10).

Hence, it is the individual manager, who decides upon the measures and practices to adapt in order to win the project and to meet the organizational objectives (Too & Weaver, 2014). Therefore, the tender manager has a central role to implement sustainability. Yet, Silvius, Kampinga, et al. (2017) found, that sustainability criteria are not yet fully considered, - and integrated in managerial decision-making.

In respect to that, it is not yet well understood, which complexities managers on project level face, when integrating sustainability (Sabini et al., 2019). So far, the intrinsic motivation of the distinct manager was found to be a central success factor (Silvius, Schipper, et al., 2017) and for the contractor's perspective the client's willingness to integrate – and pay for sustainability (Peenstra & Silvius, 2018).

Based on the boundary conditions regarding the integration of sustainability for a contractor, three important conclusions are drawn regarding the success factor model and a subsequent implementation approach:

[1] The contractor can exert significant impact regarding sustainability, especially in the **early phases** of the projects as response to the brief and during which the design alternative is determined;
[2] Given the contractor's role in the value chain, the implementation of the success factor model accounts for the **sphere of influence** of the contractor;
[3] The particular role of competition must be considered, which is especially large in **the tender phase,** when the contractor submits his bids and during which the contractor has to distinguish himself from his competitors under fierce price competition.

Next to this, identifying the relevant barriers to sustainability implementation enables the derivation of adequate response strategies, which will be beneficial for successful sustainability implementation. Such barriers are presented in the subsequent section 2.3.4.

2.3.4 Barriers to the Implementation of Sustainability

Based on literature study, the following barriers are identified, hampering sustainability integration:

- sustainability is still perceived as a rather **complex, multifaceted and ambiguous concept**, which requires clarification in order to become actionable (Goedknegt, 2013; Epstein, 2018);
- There is a lack of **concrete strategies, -plans or managerial processes** (Baumgartner & Rauter, 2017; de Magalhães, Danilevicz, & Palazzo, 2018; Sroufe, 2017)
- only abstract sustainability recommendations exist, which **lack a clear reference to the applicable project life-cycle, or to the responsible entity** (Matar, Georgy, & Ibrahim, 2008);
- **mutually exclusive outcomes cause tension**, when addressing the triple bottom line (Hahn et al., 2015); for example, whenever the environmental, or social dimensions inflict the financial outcomes, which are deemed necessary to ensure business continuity (Hahn et al., 2015);
- **insufficient cross-departmental integration** throughout all operational levels (Baumgartner & Rauter, 2017; de Magalhães et al., 2018; Nawaz & Koc, 2018; Ugwu & Haupt, 2007; Wijethilake, 2017; Wolfgang, 2017); and
- the **non-adoption of performance measurement systems** (Agarwal & Kalmár, 2015; Goedknegt, 2013; Kivilä, Martinsuo, & Vuorinen, 2017; Peenstra & Silvius, 2017), which could be guided by existing, standardized infrastructure assessment tools (Griffiths, Boyle, & Henning, 2018), but lack application and experience in the dredging sector (Hayes, 2016).

In sum, the lack of structured approaches towards sustainability implementation causes sustainability objectives to remain stuck within the initiating departments (Wolfgang, 2017). Besides, there is no clarity of what is needed for its operationalization (Wijethilake, 2017). After all:

> *"A strategic plan without an appropriate implementation process is just a pile of worthless documents" (Hammer, 1997, p. 103).*

At the same time, sustainability implementation calls for organizational change management (Sroufe, 2017). This supports the need for a success factor model that takes into account the organization as a whole. The ensuing section 2.4 presents the approach taken for its compilation.

2.4 Sustainability and Integration Success

This section forms the *backbone* for answering the central research question (CQ) and realizing the central objective (CO). First, a corporate sustainability maturity model is presented, that is compiled based on the literature review (see 2.2.1), which facilitates answering SQ1.

Second, a model of project success is introduced to become the point of departure for the success factor model to be designed. After the design approach is clarified, a preliminary list of success factors based on theory is established, which is critical input for the conceptual framework of this study and adds to SQ3.

2.4.1 The Stages to realize Complete Integration of Sustainability

To **define full sustainability integration**, this section presents the different maturity stages an organization passes based on section in 2.2.1, resulting in a maturity model tailored to this thesis. The model has been presented to – and validated by two sustainability experts and a project manager from practice. Table 3 summarizes the expert's profiles.

During the validation process, the compiled maturity model was presented. The experts were asked to give feedback to the model regarding its applicability, usefulness and comprehensiveness.

Table 3: Sampling of Experts for Validation of the Corporate Maturity Model

	Role	Background	Exp.* [a]	VO** [a]
1	Sustainability manager	Civil Engineering	19	8
2	Environmental manager	Environmental Sciences	16	12
3	Project manager	Civil Engineering	8	10

As a result, minor adaptations had to be made regarding the clarification of words and its structure. For instance, the third level initially contained the word "pro-actively [*seeking opportunities*]", which was excluded to avoid confusion with pro-active sustainability as understood in this thesis. This is because pro-active refers to the opposite of re-actively acting upon the client's requirements. Furthermore, upon the sustainability manager's recommendation, Wetzels (2016) was added to the list given its consideration of a dynamic context. However, adding this reference did not lead to alterations regarding the content of the model. Figure 7 depicts the final model.

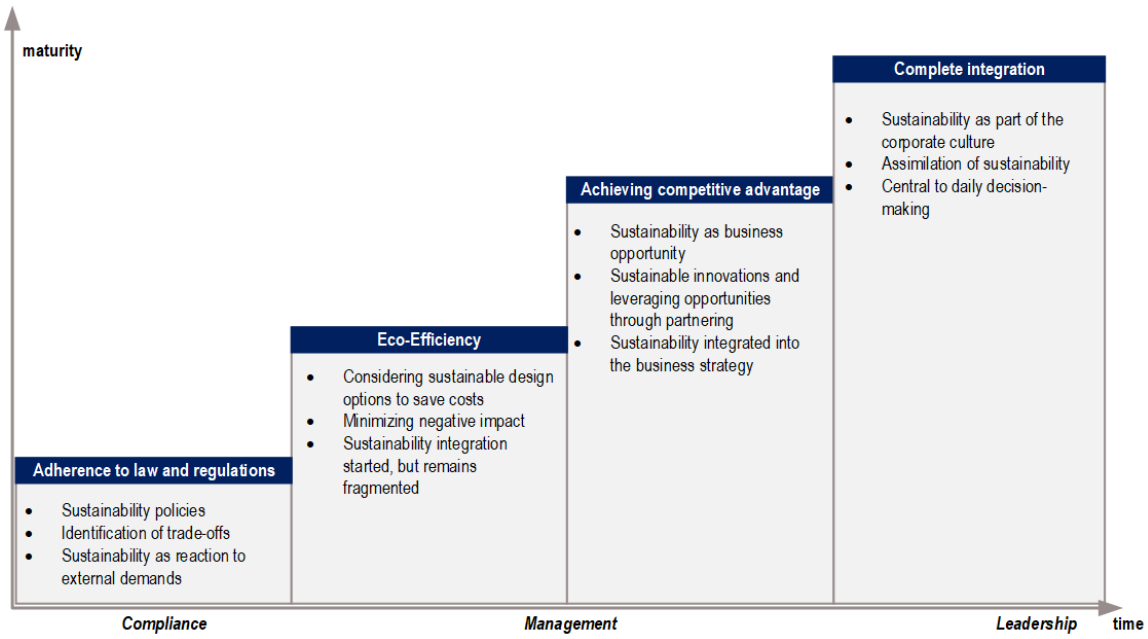


Figure 7: Maturity model for sustainability implementation into business [own compilation – and illustration, based on Epstein (2018), Muchado et al. (2017) and Silvius et al. (2012)]

This maturity model will be used to assess the perceived sustainability maturity by the respondents of the exploratory interviews in practice (see chapter 4) as well as the actual implementation based on real-life cases. This enables implications of the success factors primarily needed to mature to the next level.

2.4.2 A Framework Model for Project Success

In a broader sense, success is defined in the English Oxford Dictionary as: "*The accomplishment of an aim or purpose"* [1] and "*The good or bad outcome of an undertaking"* [2]. [13]

[13] https://en.oxforddictionaries.com/definition/success. Retrieved: 04.04.2019, 09:41.

For projects, the Project Management Body of Knowledge (2017, p.546) suggest, that

"*projects […] realize business opportunities that are aligned with an organization's strategic goals*".

Therefore, a business case is required, which considers the project objectives as well as the financial and qualitative criteria for project success. Comparing the achieved results with the identified success criteria is the measurement for success (PMI, 2017).

In this study the conceptual model of project success as proposed by Hertogh, Baker, Staal-Ong, and Westerveld (2008, p. 29) is used, adapted and tailored to the context of contractors operating in marine infrastructure. Figure 8 depicts the three dimensions of project success: the context (contractors operating in marine infrastructure), the success criteria (pro-active sustainability in projects) and the success factors (input variables to enable pro-active sustainability).

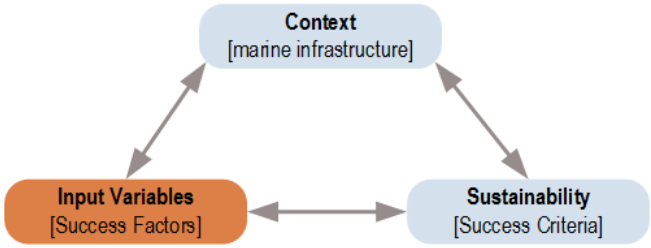


Figure 8: Project Success Model [own illustration, adapted from Hertogh et al. (2008)]

The focus of this research is on the success factors, which are dependent variables and impact the output of the system (Fellows & Liu, 2015, p. 110). The independent variable, also referred to as 'predictor variable', or 'explanatory variable' is the measurable, desired outcome. In this case, it is the achievement of sustainable projects. This independent variable (sustainability) must be further specified to enable an examination of the dependent variables (Fellows & Liu, 2015, p. 110). In other words, criteria of a sustainable project must be defined. The remainder of this section explains each component of the model and draws conclusions for the conceptual framework of this research.

2.4.2.1 Sustainability as a Success Criterion

Especially, because project managers "logically strive for project success" (Silvius, Schipper, & Management, 2016, p. 6), project managers need to consider sustainability as another success criterion alongside the triple constraint of project delivery on time, within budget - and within scope (Banihashemi, Hosseini, Golizadeh, & Sankaran, 2017).

Sustainability as a new dimension of project success has been explored for example by Silvius et al. (2016), who drew up a conceptual model, relating well-known project success criteria to the concept of sustainability. In this attempt, Silvius et al. (2016) aimed at making the social -, environmental, and economic dimensions more measurable. The most relevant success criteria associated with sustainability are the extent to which stakeholders are satisfied, the degree to which the project supports long-term business continuity and the level to which the project is executed in a controlled manner (Silvius and Schipper, 2016).

Another attempt made by Martens, Carvalho, and Martens (2016) identified project success criteria relating to sustainability along five dimensions: *efficiency, impact on the customer, impact on the team, business success, preparation for the future* and *creation of new technologies.*

To materialize the sustainability dimensions more concretely, sub-criteria are used as indicators along the triple bottom line. In this context, numerous studies investigate potential indicators and their thorough analysis would go beyond the scope of this study.

Though to enable assessment, whether a project can be considered sustainable, literature has been reviewed and sustainability sub success criteria have been compiled into a list (see table 18, appendix A-II). The point of departure was the sub-success criteria framework as developed from a tunnel project (Gijzel, 2014) in the context of Dutch infrastructure projects. Further literature was used to tailor the list towards marine infrastructure projects. Based on this list, the selection of case studies may take place to test the success factors for sustainability integration

2.4.2.2 The Context Variables for achieving Sustainability

To operationalize the success factors in practice, this thesis distinguishes three context categories:

- The **internal variables** cover human and financial capabilities, the business model and the organization at large, which entails aspects such as employees, organizational culture -and structure, corporate strategy as well as project management maturity (ISO, 2012);
- The **interface variables**, which relates to all success factors, which are depending on the project network within which the organization operates; and
- The **external variables**, which include factors from the external environment such as the socio-economic, geographical, regulatory and technological background (ISO, 2012).

The sphere of influence and thus, the level of control over the success factors decreases from internal, over interface to external context. Figure 9 illustrates the different organizational contexts, in which the case company operates schematically. Considering the context variables as illustrated in the figure 9, suggests the sampling and categorization of literature accordingly.

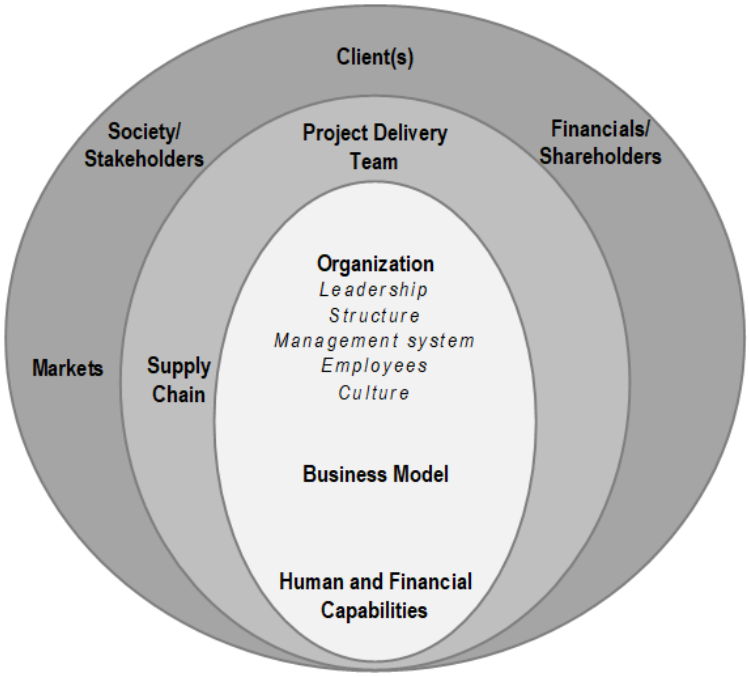


Figure 9: Context variables as input for implementation approach [internal, interface – and external context from inside to outside, own illustration]

2.4.2.3 Sampling of Success Factors for Sustainability

This section is of central importance for the study. It explains, how the list of the success factors for implementing sustainability is developed. This is critical part of the conceptual framework.

Search Criteria for the Literature Review

This research integrates the corporate – and the project-based view in the context of marine infrastructure. So far, there is no literature known to the author taking a similar approach, which is why the different concepts have to be brought together. Therefore, success factors for the implementation of pro-active sustainability are retrieved from literature of different nature:

[1] a corporate perspective (with success factors for organizational implementation)
[2] a project-based perspective (with success factors for implementation in projects)
[3] "hybrid" references, which address both, sustainability implementation within projects and possible implications for the corporate organization

Publications were retrieved from three main databases: *Scopus*, *google Scholar* and *Web of Science* as they feature the key publishing institutes such as Emerald, Elsevier, Springer, Willey, Taylor & Francis, and JStor. Table 19 lists the references used to derive an initial list of success factors and can be found in appendix IV. The table indicates author, year, title and publisher as well as an indication into which of the three author groups it belongs ([1], [2], or [3]).

Selection and Reduction Process

A selection process is put in place to assemble a meaningful list of theoretical success factors. Success factors were excluded from the list, if:

- they were listed by only one author,
- they were considered criteria for measuring the extent to which sustainability is implemented rather than factors,
- the level of detail was either too broad (container term), or too narrow (covered by other success factors)

Besides, success factors were merged, if they would address the same, but use different terminology. It was decided to include success-factors, upon being mentioned by two authors, as a bandwidth of factors enables a holistic picture. Therefore, further reduction at this stage, based on the citation frequency, is not considered useful for the purpose of the study. Instead, further reduction shall take place in conjunction with the results from empirical research, being exploratory interviews and testing with case studies. In appendix A-V, a listing and more detailed explanation can be found regarding exclusion, or merging of factors.

Clustering of the Success Factors

To assemble a structured list of theoretical success factors, clustering was used in line with the contextual variables. The three contexts internal, interface and external reflect the level of control. Therefore, the list was grouped into internal, interface and external context. Upon content analysis, the context dimensions were further sub-divided into different categories. Figure 10 illustrates the classification.

The resulting, theoretical list of 45 success factors is presented in the subsequent section 2.4.3 along with the most important implications for the subsequent steps of this research.

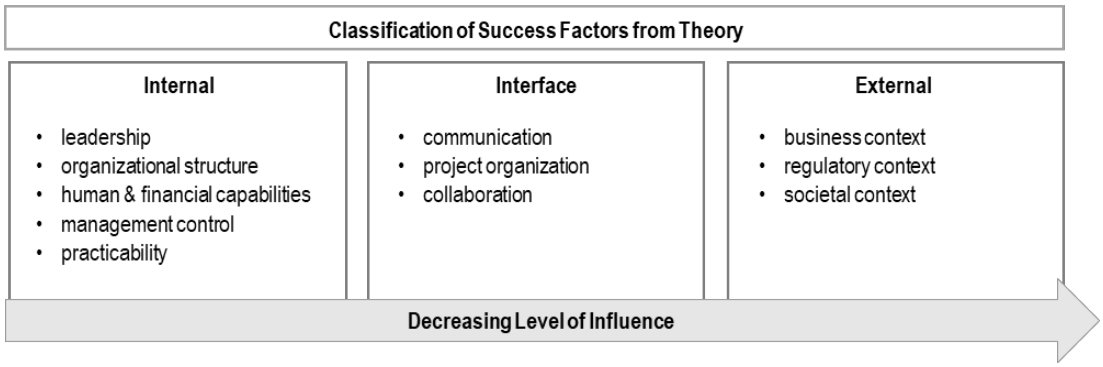


Figure 10: Classification of success factors into different contextual categories [own illustration]

2.4.3 A preliminary List of Critical Success Factors from Theory

Table 4 (page 30ff.) provides a structured overview of the success factors found in literature. From a theoretical perspective, the following top five success factors dominate (frequency cited #):

[1] 'client and stakeholder demands' (#10)
[2] 'top-management commitment and support for sustainability as central element' (#8)
[3] 'education, training and general awareness' (#8)
[4] 'engaging with stakeholders' (#8)
[5] 'knowledge/ information sharing' (#8).

Given, that only one of the top-five mostly cited factors is external to the organization, indicates the possibility for the contractor to comparatively easily take actions for the remaining four factors to ensure they are met. Furthermore, indeed success factors seem to be allocated internally, at the interface and externally to the organization. This supports the distinction of context levels.

Besides, the fact, that 'top-management commitment and support for sustainability as central element' seems a central aspect stresses the importance to not only look at project -, but also at the corporate level, so at different decision-making levels within the organization.

The list is critical input for the success factor model, because it provides the point of departure to explore the success factors found in context of marine infrastructure contractors. Based on the list, exploratory interviews are conducted (chapter 4) to eventually compile a final list for validation during the case studies (chapter 5). The next section 2.5 summarizes the conclusions on this chapter.

Table 4: Preliminary list of sustainability implementation success factors from literature review

		Engert & Baumgartner (2016)	Epstein (2018)	Kronfeld-Goharani (2018)	Brones et al. (2017)	Kumar & Rahman (2015)	Munyasya & Chileshe (2018)	Zhang et al. (2018)	Hwang et al. (2018)	Aarseth et al. (2017)	Peenstra & Silvius (2018)	Bakar et al. (2009)	Mavi & Standing (2018)	Banihashemi et al. (2017)	Matar et al. (2008)	Silvius et al. (2012)	Tamak (2017)
		Corporate View					**Hybrid View**				**Project-Based View**						
	Internal																
	leadership																
1	top-management commitment and support for sustainability as central element	✓	✓		✓	✓					✓	✓	✓				✓
2	clear and unambiguous sustainability definition - and strategy within the organization	✓	✓				✓	✓			✓					✓	✓
3	consistent communication in words and actions		✓		✓												
4	guidance and clear articulation to what extent sustainability must be integrated		✓					✓								✓	
5	distributed leadership		✓										✓				
6	developing sustainability centred culture	✓	✓		✓												
	organizational structure																
7	organizational learning sensitive to sustainability issues		✓		✓												
8	creating accountabilities, responsibilities and roles for the organization	✓			✓									✓			
9	alignment of corporate strategy, organizational structure - and processes	✓	✓		✓								✓			✓	
10	tailoring sustainability approach to business context (geographically, sector, level of impact)		✓		✓			✓								✓	
	management control																
11	project monitoring and feedback to assess sustainability performance		✓							✓		✓		✓		✓	✓
12	use of performance indicators to assess sustainability	✓	✓							✓							

13	appropriate management systems and guidelines	✓	✓					✓	✓				✓	✓
14	linking decision-making incentives to strategic objectives		✓		✓			✓						
15	using other success criteria than short-term profit alone		✓									✓		
	practicability													
16	integration of financial analysis, risks and sustainability		✓						✓				✓	✓
17	specificity and quantifiability of sustainability for practice	✓	✓					✓						
18	life cycle analysis and design for the environment		✓										✓	
	human and financial capabilities													
19	cost reduction					✓			✓					
20	capacity building and development				✓	✓		✓	✓		✓		✓	
21	resource availability								✓	✓	✓			✓
22	shift in business model / project portfolio management			✓				✓					✓	
	motivation and qualification													
23	individual attitudes, experiences, personality and competencies	✓	✓						✓			✓	✓	✓
24	individualized performance targets and reward systems	✓	✓		✓			✓						
25	recognition and appreciation of sustainability engagement	✓			✓									
26	education, training courses and knowledge	✓	✓	✓	✓			✓	✓				✓	
27	empowering people	✓		✓										
28	knowledge and awareness of sustainability			✓	✓	✓	✓	✓				✓	✓	
	Interface													
	communication													
29	knowledge/ information sharing	✓			✓	✓	✓	✓		✓		✓		✓
30	cross-departmental interaction	✓			✓									
	project organization													
31	clearly defined project goals and scope including sustainability policy									✓		✓	✓	✓

32	alignment of project objectives and organizational strategy												✓			✓		
33	competent project team				✓							✓				✓	✓	
34	clear roles and responsibilities within the team			✓							✓							
35	interdisciplinary teams				✓												✓	
	collaboration																	
36	commitment to sustainability from project stakeholders													✓		✓		
37	joint cooperation - and planning, partnering, strategic partnerships				✓	✓		✓				✓						
38	client involvement										✓	✓					✓	
39	supplier auditing		✓			✓				✓						✓		
40	engaging with stakeholders			✓			✓	✓		✓			✓	✓		✓	✓	
41	constructive relationships amongst stakeholders					✓								✓			✓	
	External																	
	regulatory context																	
42	enforcing sustainability policies and principles					✓					✓			✓				
	business context																	
43	competitive positioning and marketing advantage		✓			✓												
44	tender approach and selection criteria aligned with sustainability objectives													✓			✓	
	socio-economic context																	
45	client and stakeholder demands					✓			✓	✓	✓	✓	✓	✓	✓		✓	

2.5 Conclusions on the Literature Review

This section concludes on the key findings from theory. This serves as input for the design of a success factor model to pro-actively implement sustainability into projects during the tender phase of marine infrastructure contractors.

2.5.1 The Aspects to consider for designing a Success Factor Model

From theory, three aspects need to be considered for pro-actively integrating sustainability: First, the extent to which sustainability is integrated varies per organization, leading to differing **maturity stages.** This is captured in the maturity model, which has been compiled based on four literature references and validated by practitioners (see figure 7). This can be used for an initial assessment to subsequently derive appropriate recommendations of the actions needed to further mature.

Second, to apply the success factors in practice, the sphere of influence based on the **contextual variable** needs to be considered. Given the customized nature of construction projects, and the powerful role of the client, the level of control over the different success factors varies for the contractor. Therefore, the internal, interface and external context must be mirrored for implementation.

Third, the **interdependencies of managerial decision-making** must be accounted for to effectively operationalize the factors in practice. Based on the theory reviewed, a distinction is made between operational, tactical and strategic level.

2.5.2 The Gap between Strategy Formulation and Implementation in Projects

The integration of sustainability calls for change management. At present, there is a lack of applicable implementation processes, which support integration of strategy making on project level. To unravel the causes for the existing disparity between strategic – and operational level regarding sustainability implementation, the reviewed theory leads to the following conclusions:

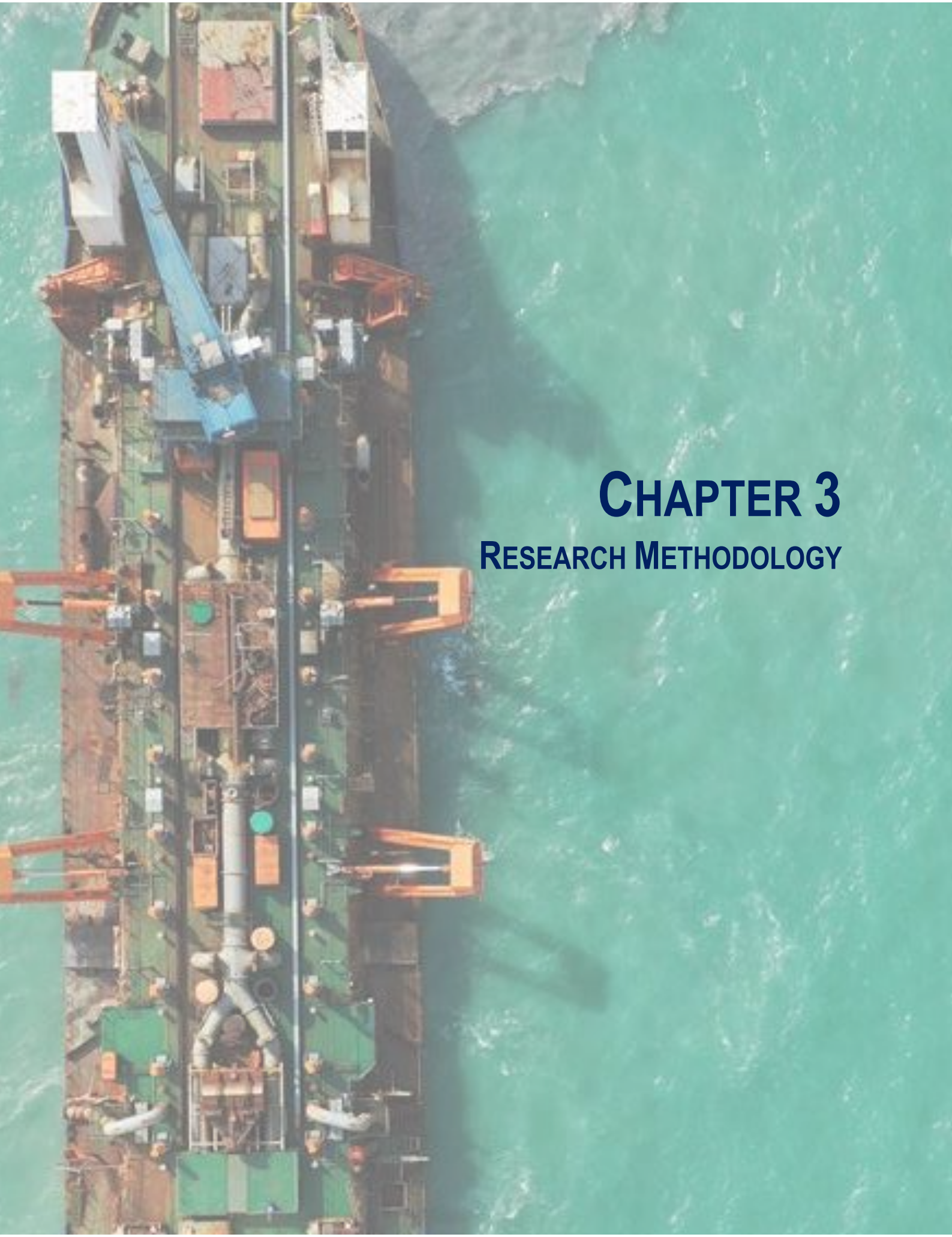
[1] Because the different decision-making levels are interdependent, project management is constrained by its governing framework from upper levels. For the roll-out of sustainability during the tender phase, it is therefore necessary to not only look at the decision-making on project level, but also to integrate success factors on tactical -and strategic level, especially given the decentralised organizational structure of contracting organizations.

[2] The key barriers found in literature relate to both the corporate level (i.e. cross-departmental integration, guidance in case of trade-offs) and project level (i.e. lack of clear reference to project life cycle and responsible entities). This stresses the cross-contextual integration of success factors for bridging the gap in practice.

2.5.3 Success Factors for Sustainability Implementation

Key outcome of this chapter is the **structured list of 45 sub success factors** for sustainability roll-out in project-based corporations (p. 23) that has been assembled along contextual dimensions (internal, interface and external) to capture the contractor's sphere of influence.

The list is used to build the conceptual framework, as it serves as point of reference during the exploratory interviews (see chapter 4). Therefore, it is critical for the design of the success factor model and a preliminary implementation approach, which is conceptualized after a comparison with the results from the exploratory interviews.



CHAPTER 3

RESEARCH METHODOLOGY

3. RESEARCH METHODOLOGY

This chapter presents the case study methodology of this research. The first section introduces the qualitative research, which is subsequently narrowed down to a case study approach (3.1). Next, the research design is explained (3.2), including data collection planning (3.2.1), the use of interviews (3.2.2) as well as data analysis (3.2.3) and data quality control (3.2.4).

3.1 Choosing a Case Study Approach for practice-oriented Research

Because the topic of this thesis lacks empirical evidence (see chapter 1 and 2), this study applies a *qualitative research approach*. Qualitative studies form the basis for constructing theory (Voss, Tsikriktsis, & Frohlich, 2002) and are especially well-suited in case of lacking empirical evidence, or knowledge (Fellows & Liu, 2015).

Next to building up theory, this thesis aims at facilitating the sustainability implementation process of Van Oord. Thus it constitutes a *practice-oriented research* based on a concrete problem (Verschuren et al., 2010). For practice-oriented research, Verschuren et al. (2010) propose the intervention cycle. Figure 11 illustrates, which part of the intervention cycle is covered by the research framework (indicated in blue).

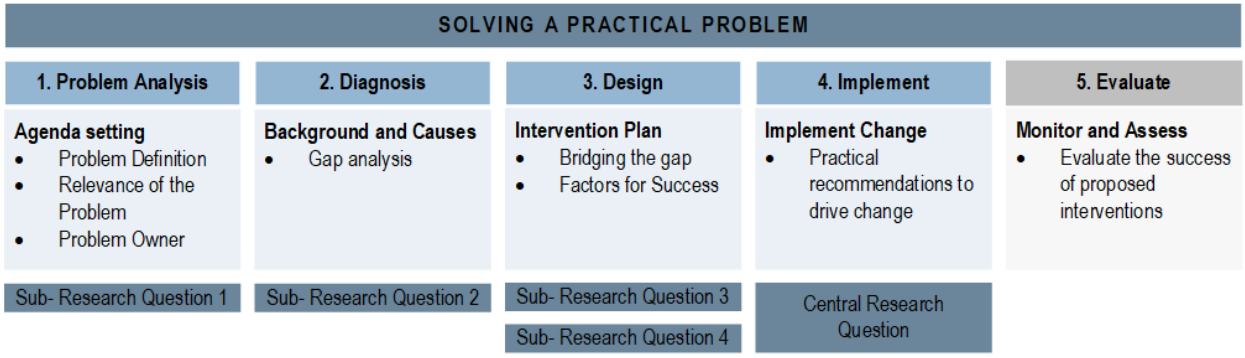


Figure 11: Modified intervention cycle [own illustration based on Verschuren, Doorewaard, & Mellion (2010, p.47)]

Data from practice is required, which will be obtained from Van Oord. Thus, the study applies an embedded approach, featuring multiple case studies within one organization (Voss, Tsikriktsis & Frohlich, 2002, p.196). The in-depth approach focusses on interpretation – and comparison based on a strategic case sample (Verschuren et al., 2010). The case selection, -interpretation and comparison are based on a conceptual framework (Verschuren et al., 2010), which constitutes the main things to be studied including presumed relationships (Miles & Huberman, 1994, p. 18). Furthermore, the approach is chosen, because of the its three great strengths (Verschuren et al., 2010). Case studies:

- enable an *integral view* on the system of matter, which is deemed necessary, when one attempt to change an existing situation;
- are highly *flexible*, which enables adaptations throughout the course of the research. This is desirable especially for early, exploratory research with only limited prior knowledge;
- tend to be easier *accepted* by practitioners, as the researcher is closer to the given context by observing actual practice. In order to facilitate change, acceptance is required.

Figure 12 presents the structure of the case study approach and distinguishes two central research phases for this study:

1. **Define and Design:** The first research phase is *exploratory*, based on a literature study (chapter 2) paired with exploratory interviews (chapter 4) to build the conceptual framework. This results in a preliminary implementation approach. Besides, this phase defines the case selection criteria.
2. **Prepare, collect and analyse:** The second phase tests the preliminary findings based on case studies. The gathered empirical evidence helps to understand implications from practice regarding sustainability implementation on project level.

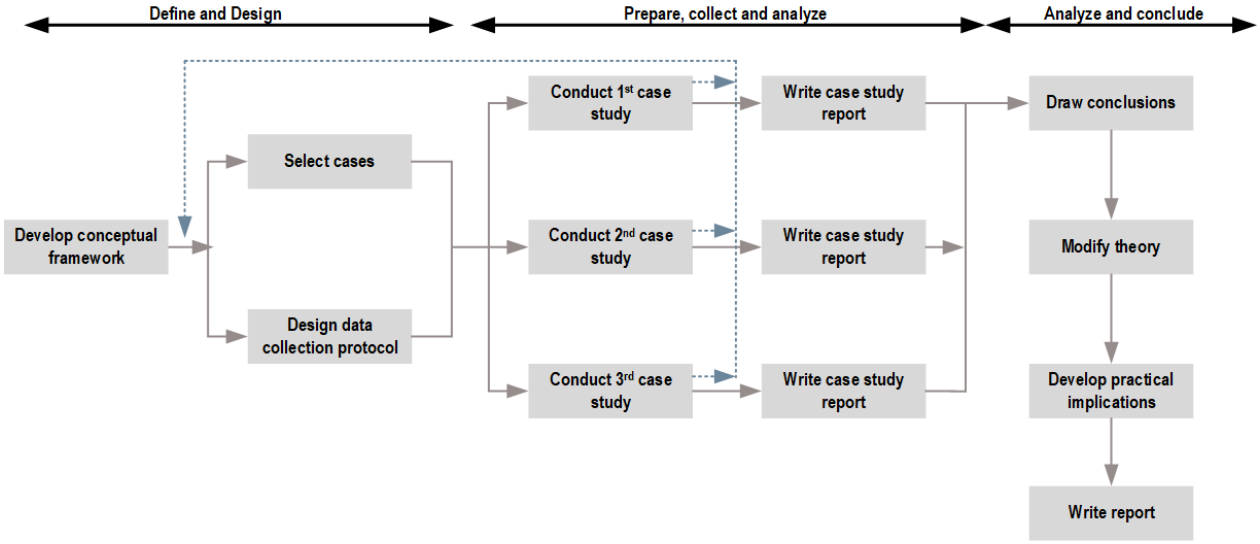


Figure 12: Case study process [own illustration; adapted after (Yin, 2017)]

3.2 The Research Design

This section presents the case study design, including data collection planning (3.2.1), the method of conducting interviews (3.2.2) data analysis (3.2.3) and data quality control (3.2.4).

3.2.1 Data Collection Planning

For this study, data is retrieved from multiple resources including desk research to generate theory, exploratory interviews to build the conceptual research framework together with the results from theory and an empirical multiple-case study approach to provide empirical evidence.

Such triangulate approach may enable profound insight regarding the way particular processes take place, and why they do so (Fellows & Liu, 2015, p.30; Voss, 2002). For the company review – and the case studies, six categories for data collection are distinguished (Yin, 2017) and consulted:

[1] Documentation (emails, memoranda, agendas, announcements, proposals, progress meetings, former studies related to the case, news in the community);
[2] Archival records (survey data by others, organizational records);
[3] Direct observations;
[4] Participant observations;
[5] Physical artefacts (i.e. tools, technological devices etc.)
[6] Interviews (to explain key events)

To increase reliability, a case study protocol is designed (see appendix C-I). The protocol is used for the data collection of each single case and is in line with Yin (2017).

Especially interviews, as one approach to collect data, are a central element in this thesis. They serve as data collection method during the exploratory stage, in which the conceptual framework is constructed (chapter 4) as well as during case study research (chapter 5). Hence, interviews receive particular attention in the subsequent sub-section.

3.2.2 Qualitative Interviews as Means of Data Collection

This section first explains, how the exploratory interviews are conducted. Then, it is shown, how the case study interviews are done.

Research Phase I: Exploratory Interviews to synthesize a Conceptual Framework

In a first step, the interviews need to be "thematized" (Kvale, 2008, p. 37), which means defining the purpose along with the intended results. The main objective is to reconstruct the respondent's perceptions regarding pro-active sustainability implementation; and to understand ,which rules govern them (DiCicco-Bloom & Crabtree, 2006).

The exploratory interviews start with an introductory part to obtain informed consent, to provide the interviewees with the context of the study, along with the intended use of the collected data (Bell, 2014). Besides, the permission to record the conversation is asked for. By assigning codes to the interviewees, the anonymity of the respondents is guaranteed (DiCicco-Bloom & Crabtree, 2006). In the main part, open questions address the key themes to be investigated, supported by prompts and probes to ensure the relevant information is collected (Bell, 2014). At the end, contact information are provided, and it is offered to share the results upon compilation.

Although unstructured interviews do not require a predetermined set of questions (Bell, 2014), the interviews make use of a script, which denotes key topics, probes and prompts to ensure data collection suffices the intended objectives and to ease the interview process (see example appendix C-I).

For the exploratory interviews, analysis takes place concurrently with data collection, which enables an emerging understanding, and which provides feedback to the sampling and design of subsequent interviews (DiCicco-Bloom & Crabtree, 2006).

Research Phase II: Semi-Structured Case Study Interviews to test the Conceptual Framework

The case studies conducts in-depth interviews to test the conceptual framework, because they support the derivation of explanations regarding the "how" and "whys" of the research (Yin, 2017). Besides, a semi-structured approach is chosen, covering a sequence of themes along with a number of prepared questions (Kvale, 2008, p. 65).

The interview questions address the success factors found in the conceptual framework and the interdependencies regarding decision-making levels and the context variables. The questions are formulated not leading, presumptive or offensive (Bell, 2014) and stimulate descriptive knowledge by using "what" questions (Kvale, 2008, p. 58). "Why" questions about the interviewees own's decision-making rationale are shifted to the end (Kvale, 2008). The interview procedure is reflected in the interview protocol (see appendix D-0), which structures the course of the interview (Kvale, 2008, p. 56).

It is hard to determine a set number of interviewees (Kvale, 2008). Given time constraint, the focus lays on key informants, who have played a central role in the selected cases and who are considered most promising for the success of the case study (Yin, 2017). All case studies would at least interview the same set of roles, because roles imply the assigned responsibility in decision-making and the same roles are likely to have a similar set of assigned expectations and behaviours, which enables better comparison of the decision-making levels (Miles & Huberman, 1994, p. 122). All interviews are recorded, transcribed and verified by the interviewees.

3.2.3 Data Analysis

Already upon data collection, early analysis takes place to improve data collection (Miles & Huberman, 1994, p. 50). This holds for the exploratory interviews, but also for the case study interviews. For the reviewed documents, summaries are compiled to retrieve relevant information (Miles & Huberman, 1994, p. 54). These forms set the reviewed document into the wider context, explain the document's role, and provide a brief summary of the findings. An example can be found in appendix C-II.

Analysis of the Exploratory Interviews (Research Phase I)

To translate the raw data into categories, coding is used (Fellow & Liu, 2015, p.101). Coding can drive data collection (Miles & Huberman, 1994, p. 65) and thus starts in conjunction with the results from the exploratory interviews. Given its exploratory nature, *the first research phase* employs an inductive coding approach (Miles & Huberman, 1994, p. 58). Data is reviewed, labelled and categorized. Subsequently, categories are established, finally resulting in the proposed conceptual framework. This framework is tested based on the second research phase: case study analysis.

Analysis of the Case Studies (Research Phase II)

The second research phase employs a combination of inductive and deductive coding, including multiple iterations to prepare analysis. At first, the data is reviewed and assigned to the codes from the first research phase (deductive coding), so that the empirical data is catalogued in line with the success factors found in the conceptual framework. Then, inductive coding takes place to enable building theory from the data and to supplement the existing, preliminary framework from section 4.4. The case data analysis takes a stepwise approach:

- Each case study is first treated separately to demonstrate, to what extent the success factors found in the exploratory phase are present in the distinct cases;
- Subsequently, across the cases, replication logic is applied, which shows the similarities - and disparities between cases. This allows inferences regarding the application of the model in practice for other cases and is especially relevant as projects are unique, highly depend on their context and follow decentralized decision-making (see chapter 2);
- Afterwards, decision-making levels are analysed to infer conclusions about their hypothesized interdependencies;
- Upon deeper analysis, pattern matching is used to cluster codes into sets (Miles & Huberman, 1994, p. 69). For a structured approach, categories, groups and relationships between them are established (Fellows & Liu, 2015, p.101). This is supported by a qualitative data analysis software MaxQDA.

Analysis of the results takes a **quantitative and qualitative approach**. Quantitatively, the *importance of the success factors* is assessed based on the frequency of coded segments per interviewee.

To identify *interdependencies* between the success factors regarding their mutual reinforcement, or cause effect-relationship, results are displayed in code-relation networks. The strength of code relations is based on the frequency, with which the coded segments overlap. To explain the quantitative representation of results, qualitative analysis takes place.

Qualitatively, interviews are read through multiple times. Subsequently, the responses given in the interviews have been compared per case, - across the cases and - across decision-making levels based on the assigned codes. New insight are highlighted and discussed. Finally, data saturation occurs, when no new insights are obtained from the data and their analysis (Fellows & Liu, 2015, p. 101).

Verification and Validation

The reliability of the results is enhanced by a verification process. The interview respondents are asked to confirm the correctness of the transcribed interviews and to provide feedback regarding their ability to observe, replicate and confirm the results to uncover errors in the methodology or interpretation. (Fellows & Liu, 2015, p.92). This holds for the exploratory – and case study interviews.

The results from the exploratory phase are compared to theory and the results from the case studies are compared to the conceptual framework. This supports internal validity (Yin, 2017). Additionally, a focus group discussion validates the final outcome of the study, involving professionals from the industry. Detailed information regarding the validation process is provided in chapter 6, where the results are discussed.

Upon conducting case study research, some risks and limitations have to be taken into account, which may threaten the research quality (Flyvberg, 2006). To minimize the effect of this, section 3.2.4 demonstrates the potential threats – and the measures taken.

3.2.4 Ensuring Data Quality Control

For data quality *internal validity, generalizability* and *reliability* are essential (Fellows & Liu, 2015, p.92). Internal validity refers to drawing accurate conclusions from the obtained results; generalizability is defined as the ability to transfer the results to the wider context; reliability implies, that the study may be replicated by others (Fellows & Liu, 2015, p.92).

Data quality in case study research is potentially threatened by: *the small scale, observer bias, controlling external factors* and *ruling out alternative explanations*. Therefore, cautious measures are taken to ensure meaningful results. Figure 13 summarizes this visually, while the measures taken per quality dimension are listed and explained thereafter.

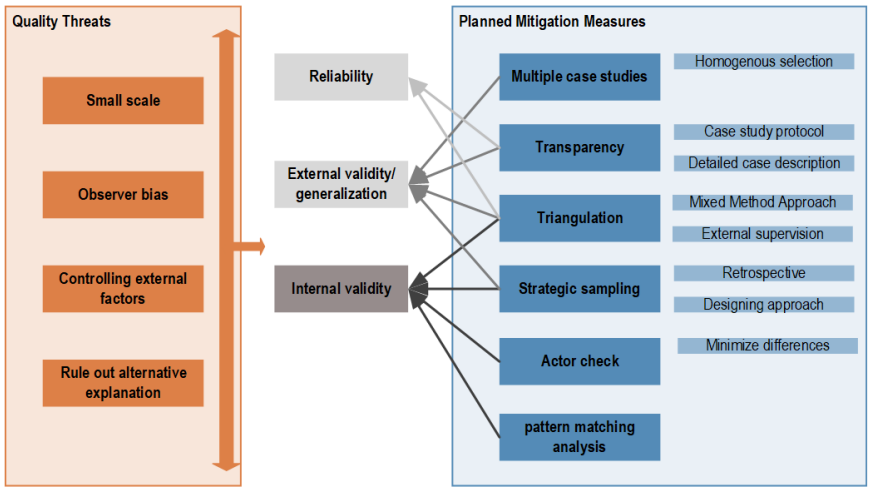


Figure 13: Threats and mitigation measures for quality control [own illustration]

- **External validity** is addressed by studying multiple cases, by triangulation (using multiple data resources and matching theory with empirical results), by continuous external verification based on weekly supervisor meetings, by enhancing transparency through detailed case descriptions and strategic sampling.
- **Internal Validity** is addressed by triangulation, by strategic sampling, by an actor check to minimize error variance, and by pattern matching analysis as proposed by Fellows and Liu (2015, p.101).
- **Reliability** is addressed by triangulation as well as by enhancing transparency by making a case study protocol (Yin, 2015), which would guide the case studies based on the results of the first research phase.

3.2.5 Operational Criteria for Case Study Selection

A strategic choice of cases is of utmost importance for multiple case studies (Fellows & Liu, 2015, p.116, Flyvberg, 2006; Voss et al., 2002). Hence, prior to formal data collection, a screening procedure of the project portfolio takes place to identify suitable cases (Yin, 2017). The screening makes use of contacting knowledgeable people, who are queried about case candidates. Operational criteria are identified to streamline the case selection. Below, the list of qualification criteria and their implications are provided.

[1] Data availability, including confidentiality, sensitivity and ease of provision (Fellows & Liu, 2015, p.150)

This includes thoroughness of the documentation and accessibility of key stakeholders for conducting interviews.

[2] Minimize differences of participants to avoid variance error (Fellows & Liu, 2015, p.97)

This implies having the same set of roles with similar abilities, personalities and past history present during the tender phase, including a dedicated tender manager, an environmental engineer and a representative from strategic level, who had been involved in project acquisition. Having tender teams led by a manager with a comparable degree of working experience in the field (measured in years) and educational background.

[3] A homogenous case sample regarding key characteristics (Fellows & Liu, 2015, p.116, Verschuren et al., 2010)

All projects are marine infrastructure projects including dredging scope; should be based on an integrated contract, covering design – and execution activities; are selected for their richness regarding sustainability in the tender phase; follow a pro-active sustainability approach, or at least had to implement sustainability to an extend beyond explicitly required by the client; should be comparable in size, that is measured in contract value. In line with the company's perception of 'complex' projects, cases above 25 Mio Euros are selected.

[4] Choosing retrospective to investigate particularly successful cases (Voss et al., 2002)

Projects must have been tendered for during the past 5 years, so that the PMO was already established within Van Oord and must at least be in project execution phase, so that the tender phase – and its interfaces (acquisition and project preparation) can be studied.

Now, that the research approach taken is clarified, the case company is introduced. The subsequent chapter leads to the construction of the conceptual framework and hence a preliminary implementation approach under consideration of insights from practice.

CHAPTER 4

COMPANY REVIEW AND EXPLORATORY INTERVIEWS

4. COMPANY REVIEW AND EXPLORATORY INTERVIEWS

This chapter reviews Van Oord, the case company and is critical input for the conceptual framework. The results presented are based on studying *the management system, the company's decision-making processes* and *exploratory interviews*.

The chapter looks at the aspects to consider for integrating sustainability and conceptualizes sustainability within Van Oord (SQ1). Besides, the barriers for the present gap are explored (SQ2) and most importantly the list of success factors from theory is combined with insight from exploratory interviews, resulting in a final success factor list as input for the case studies (SQ3). Key outcome is the conceptual framework, which combines the insights into a preliminary implementation approach for the application of success factors in practice.

4.1 Introducing the Van Oord Organization

The first part of this chapter (4.1) is based on document review, archival records -and observations to summarize empirical evidence regarding the company's processes in relation to sustainability. Additionally, the central roles in projects within Van Oord and their associated responsibilities within the company are identified to ensure an appropriate selection of interviewees for this study.

4.1.1 Corporate Sustainability Strategy within Van Oord

Corporate Sustainability within Van Oord

Van Oord acknowledges the dependency on the ecosystem, the responsibilities to communities and the changing customer expectations regarding sustainability. On their homepage, Van Oord states to work in line with **CSR** norms (or in Dutch **MVO**), reflecting their commitment towards sustainability. Van Oord is also listed in the "**transparentiebenchmark**" of the Dutch Ministry of Economic Affairs and climate policies; though, in 2017 ranging in the middle field of Dutch organizations ("peloton") and compared to another Dutch player in dredging sector, who is consider "achtervolger", falling behind (Δ70 ranks)[14].

Shifting towards pro-activeness to promote sustainable development

To promote more sustainable development, sustainability is integrated into Van Oord's business processes. This requires a shift from responding to the client's requirements towards **proactively** seeking sustainability integration into projects. For example, Van Oord conducts every two years stakeholder interviews to prioritize themes with highest impact on **economy, environment and society**. Upon assessing the impact regarding internal – and external stakeholders, actions are derived.
As a result, the **Sustainable Earth Actions (S.E.A.)** program was launched, responding to the need of communicating showcase projects better. Also in reaction to the interviews, seven of the **SDGs** were

[14] Retrieved from: https://www.transparantiebenchmark.nl/sites/transparantiebenchmark.nl/files/afbeeldingen/rapport_transparantiebenchmark_nl.pdf. 11.09.2019. 17.00.

selected on which Van Oord should focus on, reflecting their "*main business drivers and impact areas*" (van Oord, 2018, p. 39). A sustainability strategy was developed and channelled into a sustainability framework[15] (see figure 14), which was validated by 70 top managers (van Oord, 2018).

Figure 14: Van Oord sustainability framework

The framework indicates two sustainability layers: The license to operate, and the license to grow.

- The **license to operate** includes sustainability criteria, which are fundamental to legitimize operations. For Van Oord this constitutes everything, that is contained in corporate social responsibility (for a formal definition, see 2.2).
- The **license to grow** features sustainable value creation as the three key themes, accelerating climate initiatives, enhancing the energy transition and empowering nature and communities address global challenges. Table 5 summarizes the main characteristics for each theme.

Table 5: Key themes for the license to grow

	Scope	Goal
Accelerating Climate Initiatives	• activities related to protection from flood risk	• designing integral, innovative marine solutions • becoming global expert -and leader for climate adaptation
Enhancing the Energy Transition	• shifting towards renewable energy • reducing carbon dioxide/GHGs	• global trusted partner for integral offshore energy solutions • developing and operating offshore renewable energy platforms • improved use of gas
Empowering Nature and Communities	• activities to enhance economies and nature affected by marine solutions	• supporting socio-economic development • restoring and protecting nature impacted by marine solutions • adding local value (prosperity)

The ultimate goal for Van Oord is to establish fully integrate sustainability into daily decision-making, implying an organizational culture, which makes sustainability central to competing and to profit maximization. This implies "*A pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems" (Schein, 2004, p. 17).*

Already prior to this study, efforts have been made to investigate the sustainability implementation process within Van Oord. A survey on the safety culture and sustainability in April 2017 revealed, that the "*Sustainability agenda is not very visible yet but the topics are well chosen and perceived as relevant. The visibility of managers' inclusion of sustainability in their decision making is low*". Walt Meijer (2018)

[15] https://www.vanoord.com/sustainability/about-programme; retrieved: 26.02.2019 13:24

found in her research within the company that sustainable decision-making highly corelates with the individual project manager's experience and awareness.

This reflects theory, which also observes a lack of effective integration and the assigned manager constituting the key success factor. To remove this disparity, acquaintance of the critical success factors is needed to drive change towards full integration.

4.1.2 The Stage-Gate Process to manage Projects

Van Oord's activities and risks are guided by the Van Oord management system (VOMS). The integrated framework reflects the central processes (corporate procedures). The VOMS aims at guiding decision-making and to stimulate individual behaviour based on a stage-gate process.

The stage-gate process integrates decentralized decision-making into the overall organization

This is because it *ascertains clear and transparent decision-making moments.* It prescribes distinct deliverables at definite moments of the project life cycle, distinguishing acquisition, tendering and realization. Reviewing the management systems is leading to the following conclusions:

- project acquisition is an essential decision-making moment, because the area manager decides, which projects to tender for and therefore to what extend the project's objectives are in line with the company strategy;
- the conflict between short-term efficiency (a low price indication) to win the bid and long-term sustainability objectives is especially high during tendering;
- time pressure is high and any sustainability initiative which may be desired in execution, but adds up to the costs, must be accounted for already;
- tendering is distinctive, because the design alternative is determined, which becomes contractually binding;
- the internal design brief is to achieve a "*safe, cost effective and functional design*", not yet implying the need to consider adding environmental, or social value; this could indicate an implementation gap as sustainable designs have different requirements (see chapter 2);
- the realization phase focusses on executing the project in line with the contractual requirements and applicable standards; key decisions regarding the design, budgeting and planning have been made, which limits the room for change at this stage.

Figure 15 displays the project life-cycle and the entailed sustainability opportunities as described. The funnel indicates reducing room for manoeuvre and increasing constraint by the decisions made before. The process starts with acquisition under consideration of the sustainability objectives, narrows down during tendering towards a sustainable design and engineering proposal and ends with sustainable execution.

In sum, this reflects the challenges addressed in theory and supports the need to look at the integration process of sustainability *at an early stage*. While the acquisition phase is fuzzy and thus difficult to research in the boundaries of this thesis, tendering is an established process with an assigned project manager in charge of the tender. Therefore, the research focusses on tendering.

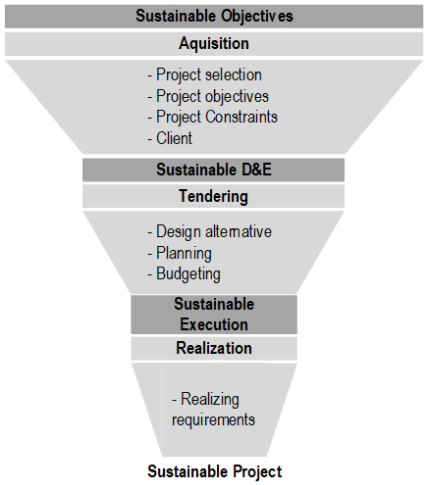


Figure 15: Sustainability funnel [own illustration]

4.1.3 Decision-Making – and Key Roles during the Tender Phase

The tender phase is divided into four subsequent phases *analysis [1], select [2], submit [3]* and *negotiate [4]* with the contract award marking the end of the tender phase and the start of the execution phase. Figure 35 (appendix B-I) depicts the phasing graphically including the stage gates. Besides, table 21 (appendix B-I) provides an overview of the different phases. A review of the stage-gates in the tender phase and its associated processes led to the following conclusions:

- The **area / business unit manager is central,** though not responsible for carrying out the tasks. This is because (s)he is the ultimate decision-maker, provides a vision and objectives and hence, provides the boundary conditions for decision-making of the tender team.
- The **strategy to win** is vital for the tender phase. This is determined by the **tender manager and the area/ business unit manager**. The responsibility, whether sustainability is used as a differentiator, or not lays here. This has a critical impact on the design brief of the tender team.
- To date, the **selection phase decides on design alternatives**, but does not explicitly include the objective of seeking sustainability opportunities. Instead, the focus lays on functionality, cost-effectiveness and safety. However, to mature in sustainability implementation, it should become an integral part of the processes and hence, should be reflected in the stage-gate process.

The above suggests, that sustainability is not yet fully integrated into the business processes of tendering. Thus the present management system does not provide the necessary support infrastructure and does not trigger sustainability considerations early enough. This could explain, why sustainability is mostly considered on the tender manager's own initiative (van Walt Meijer, 2018). Next, an actor scan identifies roles responsible for sustainability integration. This enables targeted sampling of interviewees for the exploratory interviews and for the case studies.

Actor Scan – Roles contributing to the Tender Phase

Figure 16 depicts the key roles, their responsibilities and interdependencies during the project tender phase. The scheme illustrates the information flow over the company's hierarchical levels. The arrow (orange) indicates the level of integration regarding strategic policy making. The actors displayed are present in *any* tender of Van Oord. Staff – and functional departments, such as legal and contracting, -or procurement, provide support – and input to the tenders on demand, or when necessary.

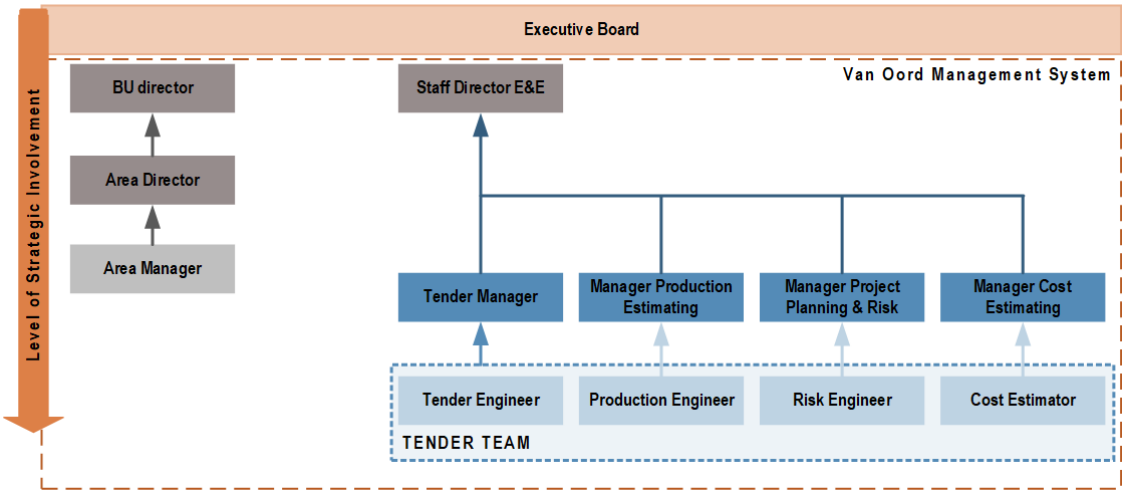


Figure 16: Actors and decision-making processes in the tender phase [own illustration]

The actor system confirms the multi-layered approach as suggested in theory, distinguishing strategic, tactical and operational level.

- The **strategic level** includes the area -and staff directors. This level of decision-making, is most actively involved in strategy building and constitute the key decision-makers of the department, or business unit under their responsibility with direct communication lines to executive management.
- The **tactical level** includes managers who oversee the operational level and who *plan, coordinate and approve* the tasks of tenders and projects; they participate in choosing the projects to tender for and provide input to the strategy to win, which affects actions on operational level.
- The **operational level** is composed of the tender team under the lead of the tender manager; the tender manager is key to decision-making and rather tactically involved; project level delivers the projects based on the strategy to win and requirements set by the client and tactical level. While the engineers can influence the design, they depend on the instructions and intend provided by the upper management.

The sphere of influence on strategic objectives decreases from the bottom to the top. Key actors responsible for implementation of the strategic objectives are on executive – and tactical level. Appendix B-I contains the tables with in-depth information regarding the different roles and responsibilities based on which figure 16 has been drawn up. Based on the actor system, the sampling of respondents for the exploratory interviews takes place to capture the perspective regarding the success factors for sustainability of all decision-making levels.

4.2 Exploratory Interviews

Exploratory interviews have been conducted to build up a conceptual framework as input for the case studies. This section presents the sampling of interviewees and subsequently the results. Key outcome is a success factor list, that compares – and modifies the list from theory in line with the responses from the interviews (see 4.2.3).

4.2.1 Interview Procedure

The key themes addressed in the exploratory phase are the concept of sustainability in the context of Van Oord (SQ1), - the root causes for the implementation gap (SQ2) and the success factors for sustainability implementation to close the gap (SQ3). The script used (see example appendix B-II) ensures guidance throughout the interviews. For more elaborate information on the methodology, the reader is referred to the methodology chapter (sub-section 3.2.2).

4.2.2 Sampling of Interviewees

Given the time constraint, sampling of interviewees is crucial as the choice limits the potential information and hence, conclusions to be obtained (Huberman & Miles, 2002). Table 6 provides an overview of the interviewees (coded) and their profile. Next to the conclusions from 4.1, snowball logic was used to obtain the sample. This means approaching actors based on recommendations from experts within the company, or if they were referred to throughout the interviews.

The table indicates, that a *c-section through the organization* was achieved by interviewing key actors from all three decision-making levels: strategic (**S**), tactical (**T**) and operational (**O**). This is in line with the findings from theory – and the findings in 4.1. The results of the exploratory interviews are presented in the following sub-section.

Table 6: Interviewee Sampling – Exploratory interviews

Cd	Role	Dep./BU	Background	Expertise	Exp.* [a]	VO** [a]
S1	Managing Director	PROF	Civil Engineering	Process optimization project management	25	25
S2	Business Development	BU	Civil Engineering	Commercial Business development project management	30	30
S3	Managing Director	BU	Civil Engineering	project management commercial / operational	25	25
T4	Area Manager	BU	Civil Engineering	renewables offshore wind	21	5
T5	Tender Manager	BU	Agricultural Engineering	tender management area middle east and Asia	31	28
T6	Tender & Estimating Manager	E&E	Civil Engineering	tender support offshore / offshore wind	20	4
T7	Engineering Manager	E&E	Mining Engineering / Engineering Geology	innovation management engineering management	29	29
T8	Tender Manager	E&E	Civil Engineering	sustainability EMVI tenders	11	1
O9	Environmental Engineer	E&E	Environmental Sciences	Project management Social/env. governance Due Diligence	16	12
O10	Sustainability Coordinator	QHSE	Water Management	sustainability energy management	4	3.5
O11	Project Engineer	SMD	Mechanical Engineering	fuel emissions fuel efficiency	<1	<1
O12	Project Engineer	E&E	Transport Infrastructure and Logistics	cost estimating sustainability	3.5	3.5

4.2.3 Results from the Exploratory Interviews

The overall results and conclusions from the exploratory interviews are summarized in table 7. These conclusions and implications will be further validated based on the case studies (chapter 5). The following paragraphs present the findings regarding: the concept of sustainability [1], barriers [2] and the success factors [3].

[1] The Concept of Sustainability within Van Oord

To construct the concept of sustainability within Van Oord, and to subsequently assess the firm's sustainability maturity, interviewees were asked to define sustainability [1], to distinguish the case of pro-active sustainability as central part of the corporate strategy [2] and to assess, whether the concept of sustainability is clearly defined within the company [3].

None of the respondents could define sustainability in a brief and clear manner; respondents referred explicitly to sustainability as a '*broad concept*', or '*abstract term*' (S1, T5, T7, O9, O11, O12) confirming the findings from theory of sustainability being a complex concept. Only one respondent (O9) mentioned the triple bottom line of people, planet and profit. To conclude, sustainability could not be clearly defined, instead it seems intuitively interpreted (Wolfgang, 2017).

The **notion of pro-active sustainability** resulted in two main perceptions, pro-active sustainability as:

[a] the opposite to reactive, focussing on a mitigative sustainability approach and the shift towards more sustainable practices without external requirements being the trigger (S1, S3, O10, T8, O11, O12)

[b] the "license to grow", seeing sustainability as *a new business model*, providing opportunities for adding value and serving as a differentiator for competitive advantage (S2, T4, T5, T6, T7, O9); especially actors on tactical level perceive sustainability as means for competitive advantage, which could relate to their commercial focus.

Figure 17 displays the results of the exploratory interviews, and the perceived role of sustainability in line with the model as introduced in 2.4.1.

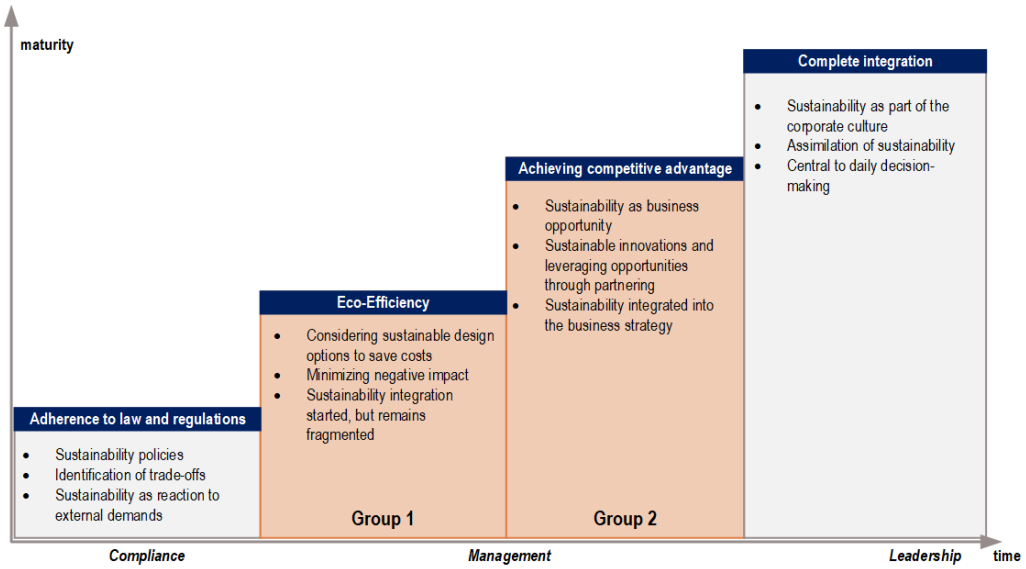


Figure 17: Perceived sustainability maturity of Van Oord [own illustration]

This discrepancy confirms the lack of clarity regarding the strategy and also regarding the perceived sustainability maturity. This hampers sustainability implementation in view of the respondents. Therefore, the practical implication is to communicate the strategy in simpler terms.

[2] Delineating the Gap between Strategic – and Operational Level

The exploratory interviews addressed barriers, which was compared to the findings from literature. The following barriers – and implications are derived:

- **the ambiguity of sustainability**: the lack of a clear definition constraints the practicability and the extent to which sustainability is operational within daily business
- **the industry-specific mind-set**: the prevailing mind-set reacts on the client's demands rather than pro-actively setting own standards (T4, O9, O10, T8, O12) and is considered deeply rooted in the professional culture. This requires a shift from being 'just followers' (T8) towards asking pro-actively 'is what the client asks for the right thing, or are there more sustainable alternatives' (T4)
- **misalignment between project objectives, tender approach and sustainability strategy:** the project's objectives must be in line with the organization's strategic objectives to provide sufficient room for realizing sustainability. Importantly, the tactical management pertains a key role as 'area managers and directors are the internal clients […] therefore, their perception and attitude counts' (T6)
- **the absence of addressing potential trade-offs and integrating the financial dimension:** given the 'lack of clarity, where the profit part is' (O9), implementation is hampered. Especially, because proposals in tendering are under tight cost constraint, it must consider the sustainability's costs and benefit. Hence, potential trade-offs must be addressed to ease managerial decision-making
- **geographical fragmentation:** satellite offices are detached from the head office and the operating context differs. Thus, tailored sustainability strategies are needed per geographical area

Also in this case, theory and practice align as the same barriers towards sustainability implementation were found during the interviews as in the literature review.

Table 7: Summary of findings, conclusions and implications of exploratory interviews

	Findings	Conclusion	Implications
Sustainability	> prevailing notions of sustainability: [1] Taking care, [2] Minimizing negative impact, [3] Value creation, [4] Sustainable processes – and products, [5] Effective project approach, [6] Engaging with stakeholders	> no clearly established definition	> providing sustainability definition and guiding principles based on the sustainability dimensions most important to the context
Key barriers	> lack of clear sustainability definition	> challenges practicability as employees are unaware of the implications on their daily work	> requires further communication internally in easier terms
	> industry-specific mind-set (reactive)	> tendency to comply with requirements given nature of client contractor relationship > hinders pro-active approach	> requires rethinking of roles and acknowledging value of pro-actively integrating sustainability
	> present tenders provide only limited sustainability opportunities	> misalignment of tender approach, success criteria and sustainability dimensions challenges implementation	> projects should be more in line with strategic objectives > accepting projects with adding value opportunities and good client relations to materialize strategy
	> lack of addressing economic dimension incl. potential trade-offs and conflicts and financial integration	> challenges practicability > lack of guidance for managerial decision-making	> upper level management must provide framework for decision-making in line with expected objectives and to what extend sustainability shall be integrated
	> geographical fragmentation and decentralized operations	> challenge integration due to detachment from head office > client and context differ	> tailored approach to the needs of BUs and area > seeking integration and improved information sharing between on-site and office works
Key Success Factors	> client and stakeholder demands	> reflects the industry-specific mind-set > shows, that client remains champion in the client-contractor relationship	> need to find ways to exert influence on requirements more in line with strategic objectives
	> client involvement	> approach to deal with client demands and steer towards more sustainable project by influencing and educating the client	> further explore relationship between client involvement, client demands and sustainability integration
	> clear and unambiguous sustainability definition - and strategy within the organization	> removes the key barrier > reflects the need for clear guidance	> strategy has to be further clarified
	> top-management commitment and support for sustainability as central element	> upper decision-making level provides framework for lower level decision making	> extend of sustainability implementation on a higher level impacts lower level
	> tender approach aligned with sustainability objectives	> conflict between tenders on price with limited opportunities to add value and sustainability	> tactical level must account to balance project portfolio in line with strategic objectives
	> early involvement of contractor	> possibility to shape project scope together > enables implementation upon designing alternatives	> focusing on client-contractor relationship > considering sustainability before execution phase has started
	> opportunity-based thinking	> reflects pro-active mind-set, contractor anticipates chances to create value	> supporting opportunity-based thinking by leading examples, and increasing awareness

Success Factors for Sustainability Implementation in Marine Infrastructure Projects

Based on content analysis, the success factors as suggested by literature were compared to the respondent's answers. The success factors mentioned throughout the interviews were generally not directly asked for, but mentioned upon the interviewees own initiative to avoid bias.

As a result, a list of **45 success factors was compiled**, that shows a comparison to the list from literature (see table 8). Additional factors, that were suggested in practice have been added to the list. All newly introduced success factors will require verification – and validation throughout the case studies. Success factors not mentioned at all have been excluded from this list.

Table 8: Comparison results exploratory interviews with success factors from literature

		Strategic			Tactical					Operational			
		S1	S2	S3	T4	T5	T6	T7	T8	O9	O10	O11	O12
	Internal												
	leadership												
1	top-management commitment and support for sustainability as central element	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓
2	clear and unambiguous sustainability definition - and strategy within the organization	✓	✓		✓		✓	✓	✓	✓	✓		✓
3	consistent communication in words and actions	✓			✓		✓	✓	✓				✓
4	guidance and clear articulation to what extent sustainability must be integrated		✓				✓	✓					✓
5	developing sustainability centred culture		✓	✓	✓		✓			✓			✓
	organizational structure												
6	organizational learning sensitive to sustainability issues		✓										
7	creating accountabilities, responsibilities and roles for the organization						✓						
8	alignment of corporate strategy, organizational structure - and processes	✓			✓	✓		✓	✓		✓		✓
9	tailoring sustainability approach to business context (geographically, sector, level of impact)	✓	✓		✓	✓	✓						✓
	management control												
10	project monitoring and feedback methodology to assess sustainability performance				✓		✓						
11	use of performance indicators to assess sustainability				✓				✓				✓
12	appropriate management systems and guidelines	✓				✓		✓	✓	✓			
13	linking decision-making incentives to strategic objectives	✓								✓	✓		
14	using other success criteria than short-term profit alone					✓	✓		✓	✓		✓	✓
	practicability												
15	integration of financial analysis, risks and sustainability				✓	✓		✓			✓		
16	specificity and quantifiability of sustainability for practice		✓		✓		✓		✓	✓	✓		✓
	human and financial capabilities												
17	cost reduction	✓				✓	✓						
18	capacity building and development		✓				✓						
19	resource availability	✓											
20	shift in business model / project portfolio management	✓	✓		✓		✓	✓					
	motivation and qualification												
21	individual attitudes, experiences, personality and competencies		✓	✓				✓	✓	✓	✓		
22	individualized performance targets and reward systems								✓				
23	recognition and appreciation of sustainability engagement		✓					✓			✓		
24	education, training courses and knowledge		✓		✓		✓		✓	✓	✓	✓	

25	empowering people		✓					✓		✓	✓		
26	knowledge and awareness of sustainability		✓	✓	✓				✓	✓	✓	✓	✓
	Interface												
	communication												
27	knowledge/ information sharing		✓	✓		✓		✓	✓				
28	cross-departmental interaction		✓	✓		✓		✓	✓				
	project organization												
29	alignment of project objectives and organizational strategy								✓				✓
30	interdisciplinary teams									✓			
	collaboration												
31	joint cooperation - and planning, partnering, strategic partnerships	✓	✓			✓		✓					
32	client involvement	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓
33	supplier auditing	✓								✓			
34	engaging with stakeholders	✓	✓	✓	✓		✓	✓		✓			
	External												
	business context												
34	competitive positioning and marketing advantage	✓	✓		✓		✓		✓	✓	✓		✓
36	client and stakeholder demands	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓
37	tender approach and selection criteria aligned with sustainability objectives	✓		✓		✓	✓	✓	✓		✓		✓
	Additional												
	exploratory interviews												
38	early contractor involvement/ consideration in early project phases		✓		✓	✓	✓	✓	✓		✓		✓
39	effective approach / fit for purpose		✓		✓	✓	✓		✓				✓
40	opportunity-based thinking		✓		✓	✓	✓		✓	✓	✓		✓
41	defining focus areas		✓					✓					
42	concrete sustainability solutions, tools and showcases		✓	✓		✓	✓			✓	✓		✓
43	internal sustainability programs and initiatives				✓	✓							
44	room to experiment / for pilot projects							✓	✓	✓			

The results – and analysis allow the following conclusions:

- **'client and stakeholder demands'** is perceived amongst the most relevant (10/12), reflecting the industry-specific (reactive) mindset and external orientation; yet, reacting on requirements implies limited sphere of influence
- **'client involvement'** (10/12), especially early on, helps to exert influence, to educate the client regarding the added value of sustainability and to alter inappropriate design requirements (S1, S2, T4, T5, T6, T7, O9, O10, T8, O12) and is much more in the contractor's sphere of influence
- **leadership** is needed, which shows not only the project level- but also the corporate level is important to managerial decision-making; T6 summarizes the overall perception: '*it is their task to show full commitment for sustainability, and to lead the people, what to do and where to go. They have to roll-out, how they would like sustainability to be dealt with in projects and ensure there is a clear, unambiguous sustainability approach. Moreover, they are responsible for introducing the right ideas and establishing the appropriate culture within the company.*'

Besides, two amongst the most mentioned sustainability enablers have not been mentioned in literature and therefore added to the list:

- **'early involvement of the contractor'** triggers early consideration of sustainability, which is necessary to optimize the design, to find the opportunities to add value, to provide the right approach along with good lead planning as well as to consider it appropriately in the tender price (S2, T4, T5, T6, T7, O10, T8, O12); this confirms the focus on the early project stages to leverage sustainability opportunities as suggested in theory
- **'opportunity-based thinking'** implies the idea to increase the project's value significantly, while only adding marginal (to none) costs; this requires actively seeking value-adding opportunities and suggests a more pro-active approach compared to reacting on requirements

Further, new success factors as derived from the interviews are:

- An **'effective', or 'fit-for-purpose'** project approach, which entails questioning if the requirements set by the client indeed best achieve the desired outcome and aligning methods with the project
- **'defining focus areas'** to efficiently allocate efforts for sustainability
- The provision of a set of **'concrete sustainability solutions, tools and showcase'**, which make sustainability more tangible and easier to integrate into projects under time pressure
- **'room to experiment'**, which relates to trying alternative solutions on a pilot scale with the opportunity for future upscaling

The list of success factors from practice enables the design of a preliminary implementation approach for practice. This is compiled by combining the results from the company review with the theoretical insight from chapter 2 in the subsequent section.

4.3 Building the Conceptual Framework

This section presents the conceptual framework to be tested during the case studies of the second research phase.

4.3.1 Points of Consideration for successful Sustainability Integration

The first step addressed the aspects to consider for integrating sustainability strategies (SQ1). The extent to which sustainability is present in the case of Van Oord is reflected in the sustainability maturity model, which so far positions Van Oord between eco-efficiency and seeking competitive advantage. Based on this, it will become essential to identify the missing success factors (*development areas*) within the company to provide recommendations, how to further mature.

Besides, the company review confirmed both: the need for a multi-layered approach based on interdependent decision-making levels, and the sphere of influence based on the different context variables. Therefore, both aspects will become integral part of the implementation approach in this study.

4.3.2 The Gap between Strategic – and Project Level

Bridging the gap between strategy making and implementation on project level implies the need for finding the causes (SQ2). Combining theory and practice showed the critical effect, which the organizational structure has on managerial decision-making. The tactical level pertains a key role in

driving decision-making on project level. The management of tenders – and projects is constrained by the framework provided by upper level management. Figure 18 summarizes the findings.

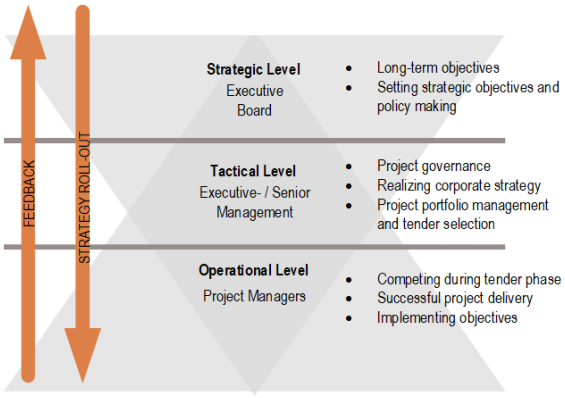


Figure 18: Multilayered integration approach [own illustration]

The key barriers of the conceptual framework are: the lack of a clear sustainability definition [1]; the absence of guidance regarding trade-offs in managerial decision-making [2]; the industry specific (reactive) mind-set [3]; the misalignment of project objectives, tender approach and the VO sustainability strategy [4] and geographical fragmentation [5].

All key barriers are internal to the contractor's organization, or at least partly, and therefore under the organization's control. The barriers relate to issues on corporate level, confirming the need to take a systemic approach, integrating decision-management on project-level with the corporate organization. Furthermore, the barriers seem to be opposite poles of the success factors identified at this stage. This suggests their criticality for effective implementation.

4.3.3 A Preliminary List of Success Factors and an initial Implementation Approach

To address the required success factors to pro-actively integrate sustainability (SQ3), findings from theory and practice have been combined. As a result, a preliminary implementation approach based could be designed, based on the 47 sub success factors found. This is derived from a list of 45 sub success factors from theory, combined with the sub success factors found in practice. Both lists have been compared and compiled as follows:

- Seven new factors found in practice, but not in theory, were kept in the list to test these throughout the case studies;
- Five success factors, which were suggested in literature, have been removed, because they have not been mentioned in practice, or are implied in other factors;'
- Two success factors from theory were preserved, though not mentioned in practice, because their implications could be relevant for this study in view of the author.

Table 20 (see appendix A-V) summarizes the alterations in detail. The remaining factors were mentioned in theory and practice and are retained for testing. The results show that managerial decision-making considers factors on corporate – and on project level. Besides, two of the five most frequently mentioned sub factors address corporate leadership, which underlines its importance to drive change.

Still, the prominence of client and stakeholder demands shows also the external orientation of contractors, so that strategy making is informed by the operating context.

The importance of the success factors is further tested during the case studies in the subsequent chapter 5. Furthermore, the new factors found in practice could be a great theoretical contribution, if they are validated by empirical evidence.

Figure 19 shows the preliminary implementation approach, which integrate the success factors. The design requirements have been incorporated leading to a 3x3 matrix, whereas the x-axis denotes the level of decision-making within the organization, and the y-axis reflects the sphere of influence the contractor has on the success variables.

Success factors were allocated on the level were action is required, or the success factor is most critical. For example, set in the *internal* context, top management commitment is in the responsibility of the *strategic* level. On the *tactical* level, in the *interface* context, the alignment of project objectives and organizational strategy is critical. Some success factors, which were considered important – and in the responsibility of all organizational levels are displayed in a blue box.

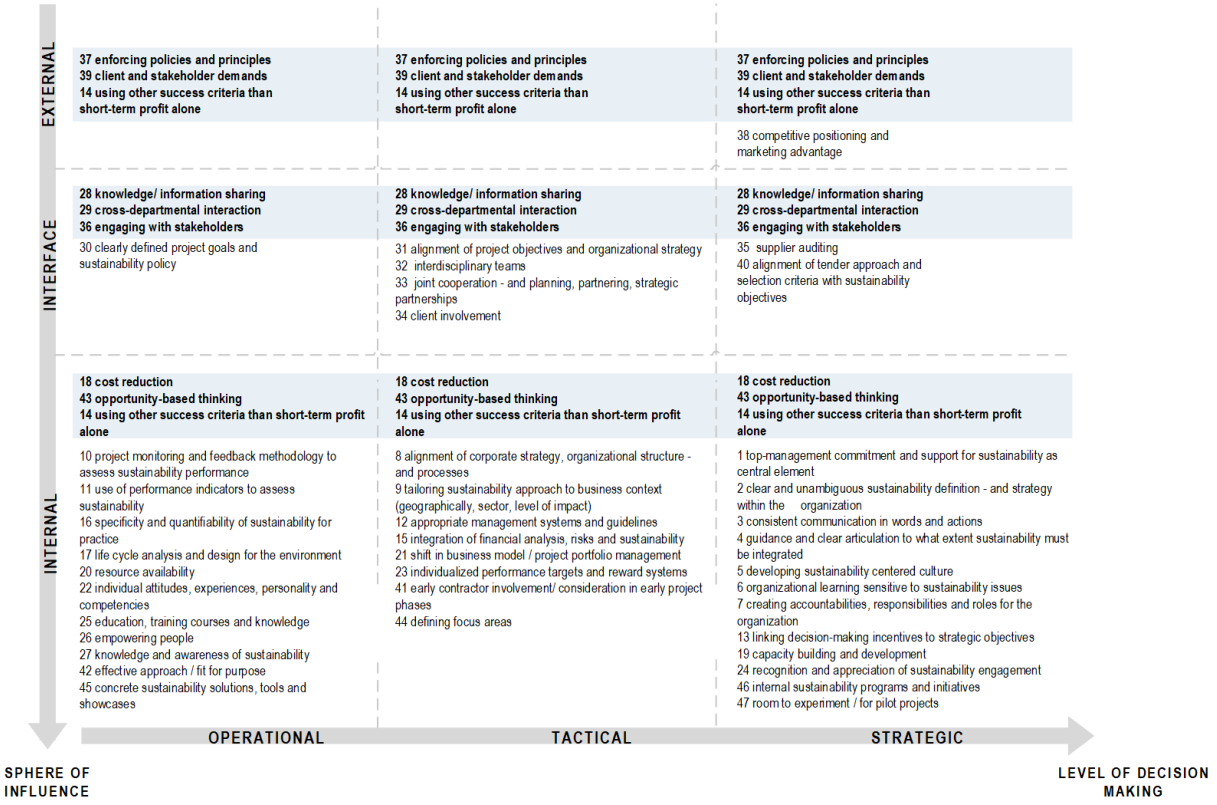


Figure 19: A preliminary conceptual success factor implementation approach [own compilation and illustration]

4.4 Conclusion on the Conceptual Framework

Key outcome of this chapter is the list of 47 sub success factors from theory and practice along with the conceptual implementation approach. The latter considers the different aspects needed for sustainability integration (SQ1). The focus is on tendering, as this chapter outlined the criticality of the early project phases, while also pointing out the considerable challenges for contractors, which need to be overcome.

The second research phase starts in the next chapter, collecting empirical evidence to synthesize a success factor model and to test the suggested implementation approach.

CHAPTER 5

CASE STUDIES

5. CASE STUDIES

This chapter collects empirical evidence to validate the hypothesises made in the conceptual framework. The primary focus lays on the success factors needed during tendering (SQ3) to subsequently result in a success factor model in 5.3. First, the selected cases studied are introduced (5.1). Then, the results and analysis are presented (5.2) resulting in the chapter conclusions (5.3).

5.1 Presenting the Case Studies

The case selection took place based on the operational criteria (see section 3.2.5). On purpose, this research examines different geographical regions, so that the success factors are tested in different contexts. Through this, interferences of success factors, which are universally applicable, or contrarily would require a tailored approach, are expected.

The sustainability criteria list as drawn up in chapter 2 (see appendix A-II) is used to check, which sustainability (sub-) criteria applied to ensure the choice of a sufficiently sustainable project as defined in this thesis. For confidentiality reasons the detailed information about the cases, including the list, is presented in appendix D-I. An overview of the key characteristics of the cases is presented in table 9.

Table 9: Overview on case study selection

Case	Location	Project Scope	Project Delivery	Project Stage
MZ	Mozambique (Africa)	• escarpment dredging • trenching and backfilling • umbilical installation • pipeline installation	• EPCI • Joint Venture Partner	• project preparation
BAH	Bahamas (Central America)	• deepening harbour basin • dredging access channel • breakwater and shoreline revetment • sheet pile quay wall installation	• D&C • Main Sub-Contractor	• finished 2017
NL	The Netherlands (Europe)	• design and construct of coastal defence structure and dike reinforcement • dredging foreshore and beach reclamation • spatial integration • 20 years *ongoing* maintenance	• DC&M • Consortium	• execution finished 2016

Data collection took place as described in section 3.2.1. A list with the data reviewed for the case studies can be found in appendix D-II, document summaries have been compiled accordingly and saved electronically.

The selection of interviewees including their key characteristics is listed in table 10. As for the exploratory interviews, the respondents cover all three decision-making levels distinguished in this thesis. The selection is further based on the level of involvement, on expertise and on accessibility in the given timeframe. One respondent per case (BAH - T6, MZ - O14, NL - O14) has been involved in the late tender phase and during execution, ensuring an understanding of the interdependencies between the different project phases.

Table 10: Interviewee selection – and characteristics multiple case studies

ID	Cd	No.	Role	Dep./BU	Background	Exp.*	VO**
MZ	S	1	Regional Manager	OFF	System Engineering and Policy Management	18	18
BAH	S	2	Director Business Unit	Dredging	M.Sc. Civil Engineering	21	21
MZ	T	3	Tender Manager	E&E	M.Sc. Civil Engineering	22	22
BAH	T	4	Project Manager	PROF	B.Sc. Civil Engineering	14	14
BAH	T	5	Tender Manager	Dredging	M.Sc. Civil Engineering	18	18
NL	T	6	Area/ Tender Manager	E&E	BSc. Civil Engineering	37	37
MZ	O	7	Environmental Engineer	E&E	M.Eng. Hydraulic Engineering	4	14
MZ	O	8	(Cost) Estimator	OFF	BSc. Civil Engineering	11	11
MZ	O	9	Environmental Engineer	E&E	System Engineering and Policy Management	1	4
BAH	O	10	Technical Design	E&E	M.Sc. Civil Engineering	27	16
BAH	O	11	Engineering Specialist	E&E	PHD Civil Engineering	21	11
NL	O	12	Technical Design	E&E	M.Sc. Water Engineering and Management	8	5
NL	O	13	Stakeholder Manager	PROF	MBO Dredging	21	21
NL	O	14	Engineering Specialist	E&E	M.Sc. Hydraulic Engineering	12	12

5.2 Results and Analysis of the Multiple Cases

The subsequent sections describe, which factors enabled success in view of empirical evidence. Analysis of the results took place as described in section 3.2.3. For readability reasons, not all tables and figures of the analysis are presented in the main body of the text. Table 11 provides an overview of results in the appendix.

Table 11: Overview of data representation for results analysis

Goal	Unit of Analysis	Represented in
to assess the importance of the success factors	the cumulative results per case	Figure 39 [a], appendix D-IV
	the relative importance cross case	Figure 39 [b], appendix D-IV
	the cumulative results per decision-making level	Figure 39 [c], appendix D-IV
to understand the cumulative results	the frequency per respondent	Figure 40, appendix D-IV
to identify interdependencies	the success factors in their code-relation networks	Figure 41 – 48, appendix D-IV-c
to explain the quantitative representation	content analysis per case, cross case and across decision-making levels	Table 29 - Table 35, appendix III-c (p.126)

5.2.1 Seven Critical Factors for Success in pro-actively implementing Sustainability

Based on content analysis, the conceptual framework could be reduced to, - and clustered into **seven critical success factors**: *corporate leadership, corporate culture, corporate structure, management control, capabilities, collaboration and the (socio-economic) context.* This alters the classification as suggested in the list of research phase I. The alterations compared to the conceptual framework are summarized in appendix D-IV-a. To present the results, this section first introduces the general observations of the case studies (section 5.2.1.1), followed by a close-up on the seven success factors and their entailed sub-success factors (section 5.2.1.2).

5.2.1.1 General Observations

In total 37 sub success factors are divided under seven critical success factors for pro-actively integrating sustainability. As suggested in the conceptual framework, success factors related to the corporate level – and the project level need to be integrated for a comprehensive view.

A first general observation is that while the cases provided evidence for the success factors needed, respondents highlighted inconsistencies (success factors present in the cases, but not the standard on corporate level) and gaps (meaning success factors not present in the organization, but needed). To capture this, table 13 lists the seven critical success factors, containing the relevant sub-factors using the following colour coding:

- *Green*: importance and presence in the cases and on corporate level;
- *Yellow*: applicability and importance, but not yet the standard for every project;
- *Red*: the entire absence of factors for the organization, or tendering in general, presenting a hurdle to implementation.

The disparity between the case specific results and general insights indicates, that every project has different standards. Based on this table, useful recommendations for practice are derived. The list helps to assess the extent to which sustainability success factors are fulfilled within an organization and therefore to assess the corporate sustainability maturity. Moreover, it delineates which success factors require attention to advance to the next maturity level.

Overall, the three-context dimension as introduced in the conceptual framework could be validated and are kept. This is represented in table 12. Some critical success factors and their sub success factors are allocated cross-context ([5], [6]).

Table 12: Identified context variables and allocation of success factors

Internal context (corporate level)	Interface context (project level)	External context
[1] corporate leadership	[5] capabilities	[7] The socio-economic context
[2] corporate culture	[6] collaboration	
[3] company structure		
[4] management control		
[5] capabilities		
[6] collaboration		

Another observation is, that across the cases, there is no significant difference regarding the dominance of certain success factors (see figure 39 [b], in appendix D-IV.b).

Though, it is noteworthy, that the NL case puts less emphasis on integrating sustainability for competitive advantage. This may be related to the fact that it was a requirement anyway. Nonetheless, all cases confirm to adapt the sustainability approach to the context.

Table 13: Case study results - success factors for integrating sustainability pro-actively

	MZ S1	BAH S2	MZ T3	BAH T4	BAH T5	NL T6	MZ O7	MZ O8	MZ O9	BAH O10	BAH O11	NL O12	NL O13	NL O14
Corporate Level - Internal														
Corporate Leadership														
top-management commitment and support for sustainability as central element	●	●	●	●	●	●	●	●	●	●	●	●	●	●
clear and unambiguous sustainability definition - and strategy within the organization	●	●	●	●	●	●	●	●	●	●	●	●	●	●
consistent communication in words and actions	●	●	●	●	●	●	●	●	●	●	●		●	●
guidance and clear articulation to what extent sustainability must be integrated	●	●	●	●	●	●	●	●	●	●	●	●	●	
shift in business model / project portfolio management					●	●	●			●	●	●		●
Culture														
developing sustainability centred culture	●	●	●	●	●	●	●	●	●		●	●	●	●
organizational learning sensitive to sustainability issues	●				●	●	●		●	●	●	●	●	●
room to experiment / for pilot projects		●	●		●		●				●		●	●
recognition and appreciation of sustainability engagement		●		●	●			●	●		●			●
opportunity-based thinking	●	●	●	●	●		●	●	●	●	●		●	●
empowering people		●		●		●			●		●			●
Corporate Structure														
creating accountabilities, responsibilities and roles for the organization	●	●	●	●	●		●	●	●	●	●	●		●
alignment of corporate strategy, organizational structure - and processes	●		●	●	●		●	●	●	●		●	●	●
integration of financial analysis, risks and sustainability	●		●	●		●	●	●	●	●		●		
tailoring sustainability approach to business context (geographically, sector, level of impact)	●	●	●	●	●	●	●	●	●	●	●	●	●	●
management control														
project monitoring and feedback methodology to assess sustainability performance	●	●		●			●	●	●	●	●	●	●	●
appropriate management systems and guidelines			●			●	●	●	●				●	●
individualized performance targets and reward systems		●					●	●	●				●	
specificity and quantifiability of sustainability for practice	●		●	●		●	●			●		●	●	●
Capabilities														
resource availability		●		●	●	●	●	●		●	●	●	●	●
concrete sustainability solutions, tools and showcases	●	●	●		●		●	●			●			●
individual attitudes, experiences, and personality	●	●	●	●	●		●	●	●		●		●	●
expertise, skills and support	●	●	●		●	●		●	●	●	●		●	●
knowledge and awareness of sustainability , training		●	●	●	●	●		●	●	●	●		●	●

Project Environment														
Collaboration & Communication														
Clearly defined project goals and sustainability policy	●	●				●		●			●		●	●
alignment of project objectives and organizational strategy	●	●	●	●	●	●	●	●	●	●	●	●	●	●
tender approach and selection criteria aligned with sustainability objectives	●	●	●	●	●	●	●	●	●	●	●	●	●	●
effective approach / fit for purpose	●	●		●	●	●	●	●	●	●	●	●	●	●
early contractor involvement/ consideration in early project phases	●	●		●	●	●	●	●	●	●	●	●	●	●
interdisciplinary teams and partnering	●	●	●	●	●	●	●	●	●	●	●	●	●	●
client involvement and joint planning	●	●	●	●	●	●	●	●	●		●	●	●	●
identifying customer value	●	●	●	●	●	●	●	●	●	●	●	●	●	●
knowledge and information sharing	●	●	●	●	●	●	●	●	●	●	●	●	●	●
External														
Socio-Economic Context														
Enforcing policies and principles	●	●	●		●	●	●		●	●	●		●	●
competitive positioning and marketing advantage	●	●	●	●	●	●	●	●	●	●	●	●	●	●
client demands	●		●	●	●	●		●		●	●	●	●	●
engaging with external stakeholders		●			●	●			●	●	●	●	●	●

Legend

● sub success factor is generally fullfiled

● sub success factor present fragmented

● sub success factor is development area

empty not mentioned

5.2.1.2 Results and Analysis of the C⁷ Critical Success Factors

The next paragraphs present the results and analysis of the seven critical success factors.

[1] Corporate Leadership

Sub success factors related to corporate leadership are considered mainly in the responsibility of top – and senior management. Table 13 and figure 20 confirm the importance assigned to leadership regarding the success of pro-actively integrating sustainability.

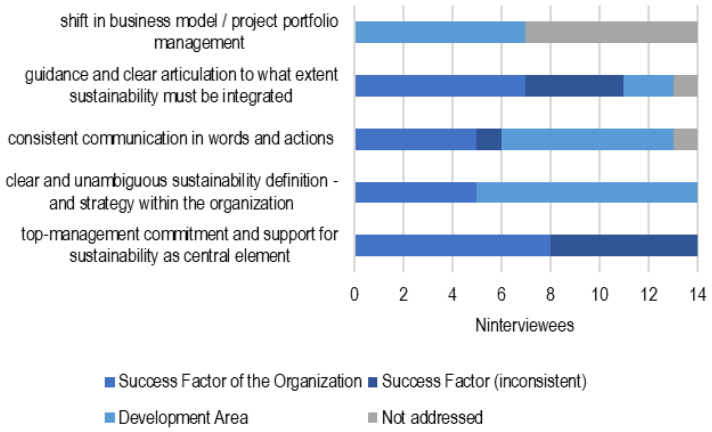


Figure 20: Overview responses - corporate leadership

Figure 20 illustrates that all sub factors associated with corporate leadership were addressed. The following can be observed:

- *top management commitment* and *a clear and unambiguous sustainability definition – and strategy* are considered essential to all respondents (mentioned by #14/14);
- the applicability and need for the remaining sub-factors was confirmed by 13 out of 14
- more than half of the possible responses indicate inconsistencies and development areas regarding corporate leadership, suggesting a gap within the company as a whole; this may explain, why not every tender pro-actively integrates sustainability;
- *a shift in business model* has been comparatively less addressed (#7/14), which may relate to the strategic implications that this factor pertains.

Some implications of the sub success factors are relevant to present more in depth:

Top management support and commitment is reflected in making available resources, but also questioning sustainability related topics during tender review meetings and giving the go ahead decisions for sustainability related ideas (S1, S2, T3, T5, T6, O7, O8, O9, O11, O12, O13, O14).

Though, interviewees especially of the MZ case relate the support to the high priority the tender pertained (S1, T3). As long as leaders in the organization are enthusiastic, but do not make room for sustainability in their internal requirements, it lacks clear expression of commitment (T3, T4, T5, O8, O9, O7, O14).

The lack of a **clear sustainability definition** combined with insufficient **guidance to what extent sustainability must be integrated** represents a key hurdle to pro-actively integrate sustainability. The following conclusions have been made in view of the responses (T3, T4, T5, O7, O8, O10, O13, O14):

- Respondents require a clearer strategy in easy terms, that reflects the meaning of sustainability for the scope of work within the organization;
- guidance is needed especially in case of trade-offs between sustainability dimensions to express the extent to which tender – and project level is expected to go beyond the client's requirements;
- corporate guidance is especially needed as tender – and project teams follow the lead of the client, so that in case of less sustainability demanding clients, a stronger lead based on the company's internal ambitions is necessary;
- respondents find the consistency between words and actions lacking, so that communication is perceived as "being ahead" compared to concrete actions.

[2] Corporate Culture

Establishing the right corporate culture for sustainability is the responsibility of leadership (S2, T3, T4, T5, O7, O9, O12). Accordingly, a sustainability centred culture pertains a shared mindset regarding sustainability, in which employees feel intrinsically drawn to integrate sustainability (S1, S2, T3, T4, T6, O9, O14).

Based on figure 21, table 13 – and the content analysis of the data, nearly all respondents (13/14) perceive developing a sustainability centred culture central for successful integration into daily decision-making.

All three case studies featured common *project cultures*, which stimulated sustainable decision making. Based on that, the related sub success factors were identified and clustered under the critical success factor corporate culture. Figure 21 depicts the related sub success factors.

Figure 21: Overview results - corporate culture

Especially, **opportunity-based thinking** is crucial to pro-actively integrate sustainability as it broadens the mindset beyond requirements and entails a thorough understanding of the client, his drivers and the context. All three case studies strongly focused on identifying, and leveraging opportunities to match the sustainable value proposition to the project context. This factor has been added to the conceptual framework as insight from practice and thus enlarges theory in view of sustainability integration. Two different approaches towards this could be observed:

- **An outside-in approach:** the **MZ** and **NL** cases applied opportunity based thinking taking an outside-in approach. This means, that both cases identified the external value drivers of the client based on a profound understanding of the socio-economic context to subsequently integrate those values into their tenders and persuade the client of the added value.
- **An inside-out approach:** the **BAH** case takes an inside-out approach. This tender, and especially the application of the coral engine, can be described as a solution seeking a problem. To further develop the reef guard program an applicable tender – and project was needed. T5 identified the BAH case as an excellent opportunity given the environmental context and the strong reputational concerns of the client. Based on that, the sustainability initiative was brought into the tender.

However, the mindset can also be a fundamental hurdle and requires an "upgrade", which implies the need for change. On corporate level, respondents do not see a sustainability centred culture yet (S1, T3, T4, T5, O7, O8, O9, O13, O14). In view of the mindset, two new aspects could be derived from the study compared to theory:

- the professional background, and
- the generation

The results show, that the strong monodisciplinary orientation regarding age and profession provide a hurdle to change within the organization. Especially paired with a strong focus on operational feasibility and requirements, construction is historically rather a re-active business (S2, T5, O7, O9, O12, O13, O14). This in turn implies, that composing diverse – and multidisciplinary teams could foster a sustainability centred culture and accelerate change. This may also support opportunity-based thinking, because different perspectives are looking at the same problem and hence, should be considered in contracting organizations to mature towards full integration.

[3] Company Structure

The findings show, that the sub success factors of the company structure are not fulfilled on corporate level and therefore provide a barrier to integration. This is depicted in figure 22, which indicates their importance for success, while not being achieved. Hence, tackling these hurdles can support the organization studied to mature regarding sustainability integration.

Figure 22: Overview results - corporate structure

In view of this, the findings related to company structure are clustered under four themes and provide conclusions and implications for change. The themes are:

[a] tailoring the sustainability approach to the project context;
[b] integrating sustainability into the corporate processes;
[c] the impact of decentralized decision-making; and
[d] the need to integrate financial analysis, risks and sustainability.

For readability reasons, findings as well as conclusions and implications are summarized in table 14.

[4] Management Control

Table 13 and figure 23 show, that management control is not a central topic in the case company. Figure 44 portrays the code relationships and indicates that management control is the least interconnected success factor. Figure 44 also shows, that having management control measurements in place strongly relates to leadership success factors such as guidance and focus areas, which is perceived as lacking on corporate level. This in turn implies the need of leaders to take actions.

Specificity and quantifiability are perceived equally important across the decision-making levels. This is needed to make sustainability more tangible for practice and to assign concrete pay-offs to show to the client (S1, T3, T4, O7, O10, O12, O13, O14).

The NL case illustrated, how the selection criteria and their scores facilitated decision-making in view of trade-offs and to determine the extent to which sustainability should be integrated (T6). The other cases did not feature such a clear guideline regarding trade-offs.

Table 14: Findings and implications from company structure

Results and findings from practice	Conclusions and implications
[a] Tailoring the sustainability approach to the context • sustainability topics vary per project and different aspects are more, or less relevant. The focus is usually on external targets, which prescribe the deliverables; and environmental targets cannot be copied blindly from one to another tender, or project (O11, O12). • since legislation also varies, there is no one fits all approach (S1, S2, T6,O7, O8, O9, O10). • however, tailoring the sustainability approach pro-actively adds complexity to the tender process, especially under time constraints (S1, T3, T5, O14). • even in less developed countries, financing institutes provide stringent sustainability requirements to which the clients will ultimately have to obey to (S1, S2, O11), • figure 41, the code relationship diagram shows a strong relationship between tailoring the approach and the need for leadership, advocating the need for leaders within the organization to tackle this issue (see appendix D-IV-c)	• the sustainability approach must be tailored to the context to deliver customer value (S2, T4, T5, O11); • leaders within the organization seem responsible to tailor the approach for their responsible business unit, but also to support identifying customer value as they determine the strategy to win (middle management, tactical level) • the fact, that also developing countries must adhere to global standards implies a possible framework to be integrated in the organizations processes to avoid starting from scratch in every project (i.e. as license to operate).
[b] Integrating sustainability into the corporate processes • sustainability is not effectuated in the corporate processes, such as the stage gate process, especially during the tender phase (T3, T6, O7, O8, O9, O10, O13, O14). • integrating sustainability into the present processes is needed, if sustainability was indeed an important point of consideration in tenders; it would demonstrate a corporate intend (T3, T6, O7, O8, O9, O13, O14). • early discussions are needed to take on board the relevant expertise, to leverage opportunities and to integrate it into the overall tender process (O9, O14). • interviewees expect senior management to put it on the agenda during the official stage gate meetings by asking follow up questions (T3, O9, O10, O14)	• to align the corporate level with strategy making sustainability must be integrated into present processes • the integration reflects commitment and potentially triggers discussions • such guidance can especially help, if the client does not ask for sustainability as it clarifies the corporate intend • middle management is responsible for integrating such strategic objectives into existing processes
[c] The impact of decentralized decision-making • figure 43 depicts a strong relation between the organizational structure and capabilities as well as project collaboration • decentralized decision-making gives great autonomy to tenders and projects (S1, S2, T4, T5, T6, O7, O9, O13) • in all three cases, the tender manager involved and integrated the necessary environmental – and social expertise; it remains in the tender, or project manager's judgement regarding risks and opportunities, whether or not to consult support departments for input (S1, T4, T5, T6, O7, O9, O13, O14) • sustainability related expertise is allocated in the corporate supporting departments, which are service providers to the tenders (O9, O14), thus, their involvement depends on the manager's request • supporting departments are oftentimes consulted late (T5, O7, O9, O14), hence the required expertise is lacking at start • in the BAH case, the area could allocate budget albeit cost cutting exercises to invest in environmental enhancement (S2)	• depending on the leader in the tender, or project, success is determined, as he is the central decision-maker regarding the capabilities needed and the establishment of an appropriate culture on operational level • the middle management on tactical level is key to align strategy making with the operations on project level • middle management pertains great autonomy to make their own decisions: they acquire the projects, they determine the strategy to win, they grant the resources and they have their own budget and hence are needed to support the strategy • the expertise for sustainability might be better allocated in a centralized supporting point, such as a tender support desk
[d] Integrating financial analysis, risks and sustainability • integrating costing, risks and sustainability can lead to project optimization and direct benefits for the client, which in turn helps to convince the client of sustainability integration (MZ case) • in the BAH case, a corporate fund stimulated leveraging sustainability related opportunities, as it eased implementation for the tender manager (T5, O11); upon budget was no longer available during execution, covering the additional costs was only possible given the project's high turnover (T4, T5) • the MZ case showed that "sustainability costs are less than 1%, even below accuracy margin, so it should be possible to invest a bit until it rolls out completely." (O8)	• integrating financial analysis risks and sustainability into a structure process can help to deliver customer value • sustainability related costs must be covered by the tender, or project, which implies, that either the client must be willing to pay (T4, O9, O10), or the project's turnover must be sufficiently large to cover additional costs (T4, T5, O8). • opportunity-based thinking is needed to persuade the client, but also the reconsideration whether a corporate budget may support integration to make it less project dependant

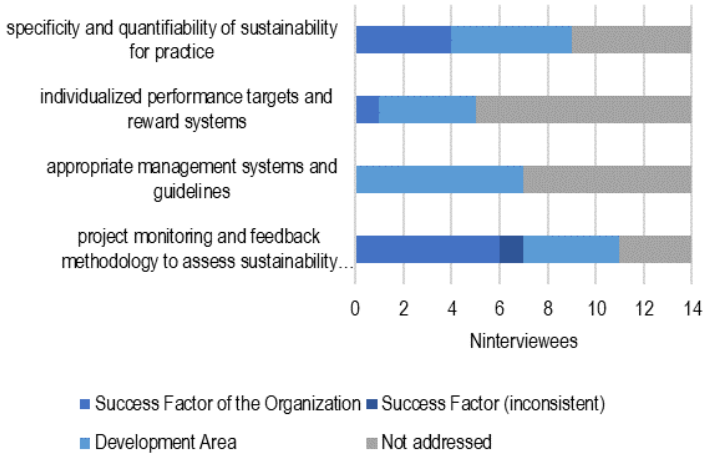


Figure 23: Overview results – management control

The remaining sub success factors of **management control** are perceived **controversially** (see figure 23). Interviewees responses vary per decision making level. The operational level tends to see the absence of appropriate control measures as hurdle to success (development area). It is observed that:

- integrating sustainability into existing processes and drawing up an internal set of key performance indicators (KPIs) would demonstrate clear commitment, enhance transparency and serves as a trigger to address sustainability related topics during official meetings (S1, T3, T6, O7, O8, O9, O10, O13, O14);
- especially the operational level sees great opportunities in accelerating implementation by providing incentives to leadership such as auditing and performance indicators adjusted to the context (O7, O9, O13);
- concrete targets could stimulate innovative powers to reach those limits and accelerate change by allocating responsibility for implementation to the key decision makers (O9, O10, O11, O13);
- presently, merely the environmental departments keeps track of tenders to question those, performing poorly on environmental and social aspects (O9, O14).

Therefore, integrating sustainability into the *existing management system and guidelines* is considered important.

However, the decision-making levels responsible for the establishment of such control systems consider management control less import. This is reflected in not mentioning the success factors, or even perceiving their presence in the company. Interviewees doubt the effect of financial incentives and concrete targets as it bears the risk of adversarial behaviour, or simply lacking effect (S2, T3, O8, O11). This may relate to the responsibility of these levels for defining the control system, which is challenging given the complexity associated with sustainability. Besides, concrete targets and control measures reduce the flexibility for adapting targets based on the project context. Though, as discussed, such tailored approach is necessary.

The controversial discussion around management control shows, that traditional static measures do not match the context of sustainability integration and new approaches are required. Furthermore, it seems that the present organizational leadership style puts less emphasis on control in the traditional sense, which must be considered when designing such a system. The responsible management on tactical level must embrace this critical success factor, as otherwise related change will not happen.

[5] Capabilities

The success factor *capabilities* distinguishes three sub succes factors: *resource availability*, *sustainability tools and showcases* as well as *competencies*. To define competencies specifically, further factors could be derived: *individual attitudes, experiences and personalities*; *expertise, skills and support* and *knowledge and awareness*. The criticality of capabilities, and the entailed sub aspects is reflected in figure 39, which denotes this success factor as being amongst the most frequently cited across all decision-making levels – and cases.

Figure 24 shows, that the sub success factors regarding capabilities are not only important to success, but also well developed within the organization. All sub-success factors associated with capabilities are present in the cases and the organization as a whole. Accordingly, capabilities regarding the social – and physical environment are being developed, whereby most respondents assign the responsibility to bring in ideas and build expertise bottom-up (S2, T3, T4, T6, O7, O8, O10, O11, O12, O14). While, many ideas and initiatives are present in the various departments, they require integration (S2, T3, O9, O10, O11, O14).

Figure 24: Overview – results capabilities

The following is observed and found in practice regarding capabilities:

- sustainability tools and showcases matter to tendering, because they are easily implemented under time pressure and the ability to thus promote competitive advantage based on concrete evidence (S1, S2, T3, T5, O7, O8, O11, O14); this is also illustrated in the code relation diagram figure 45 (appendix D-IV), denoting the strongest relationship between sustainability tools and showcases and marketing advantage
- the interrelationship between the factors entailed in competencies (figure 45) and company structure implies that the competencies in the team depend on the tender, or project manager composing the team (S2, T3, T4, T5, O7, O9, O10, O11, O12, O13, O14), which in turn impacts achieving competitive advantage
- capabilities interrelate with collaboration, as information and knowledge sharing as well as different expertise are beneficial for the sustainable outcome, but also because resources can be shared during partnering
- the intrinsic motivation based on personal values, but also professional background and generation are important drivers for competencies, especially in view of a strong client – and requirements focus (S2, T4, T5, T6, O7, O8, O9, O12, O13, O14).

[6] Collaboration

Collaboration is critical to success. This is because collaboration aligns the corporate organization with the external context on project level. This is supported by the code relation matrix (see figure 46, appendix D-IV-c) and the relative importance based on coded segments. Figure 25 depicts the results of the sub-factors assigned to collaboration.

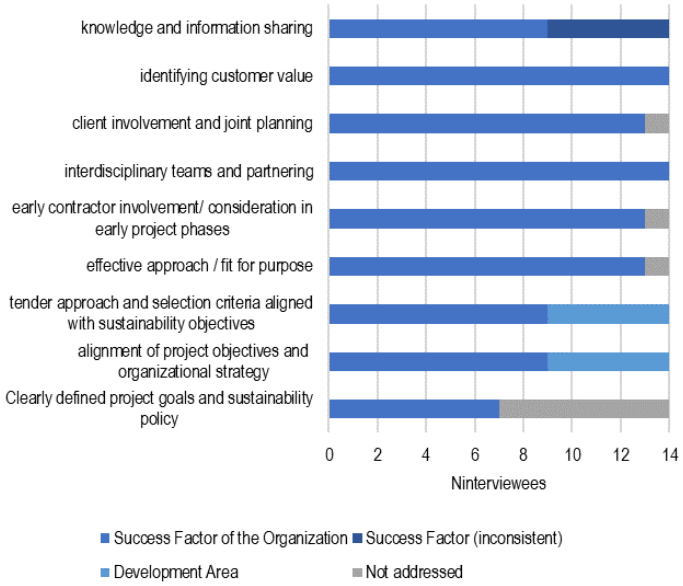


Figure 25: Overview – results collaboration

Across the decision-making levels, success factors associated with collaboration are more relevant to the tactical, and operational level (see figure 39, appendix D-IV-c, p.119). This makes sense as they are more concerned with the actual project, or tender, opposed to the strategic level. Two key findings stood out from the results:

[a] The tender team usually follows the strategy of the client

Therefore, a mismatch between the corporate strategy and the client's intention is a key hurdle to success. This is because in perspective of a contractor it is difficult to go against the client.

- In the BAH case and the NL case, clients could be persuaded to sustainability integration. Thus, significant improvements could be achieved based on joint planning and close interaction and the strategies aligned.
- The MZ tender featured less room for negotiation and interaction. While a lot has been suggested to improve the sustainability value, stakeholder interaction was contractually forbidden and only little of the initiatives proposed to enhance value was accepted by the client.

This shows, that albeit all pro-activeness, the extent to which the contractor can influence the client's wishes is limited, which in turn reduces the sustainable outcome.

[b] Contractors integrate the external context to derive sustainable value propositions for the client

The cases showed, that by engaging with the client early on, a better understanding emerged, of what the client actually wants and what his value drivers are. By engaging with external stakeholders (BAH, NL), or being aware of their demands (MZ), the cases could impact the client's requirements to integrate sustainability pro-actively. This led to a more effective approach, satisfying the client's interests, while pursuing their own sustainability strategy.

[7] Socio-Economic Context

Across the cases, this is the most frequently addressed success factor (figure 39 [a], appendix D-IV-b). Thus, this is also the most relevant success factor, indicating a strong external focus. Figure 40 (appendix D-IV-b, p. 117) shows, that leaders on strategic and tactical level are mostly concerned with the socio-economic context. Figure 26 displays the results of the associated sub success factors.

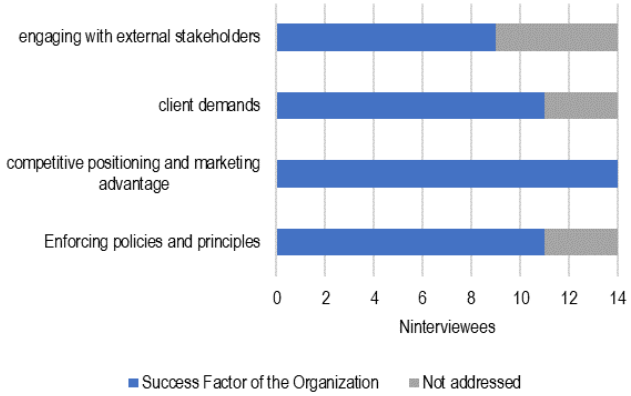


Figure 26: Overview - results (socio-economic) context

[a] Identifying the client's interest, drivers and values to achieve competitive advantage

The focus lays on the client, while the most important factor for success is *competitive positioning and marketing advantage* (14/14). This is plausible given the tendering stage, where the ultimate goal is to win the bid. Adding unrequired items tends to increase the price (T3, O7, O8, O9, O10, O11, O12, O13, O14). "*Only if the client asks for sustainability, it will be addressed as there is no point in addressing it, if he is not interested"* (T6). However, what the clients asks for is not necessarily what he wants, or what he must consider (S1, S2, T5, O9, O11, O13, O14). The strong focus on requirements bears the risk of overseeing opportunities (T5, O9), which are needed to integrate sustainability, but also to gain marketing advantage. To gain competitive advantage, it is important to question the client's brief and to identify the customer's interest, drivers and values beyond requirements. For this, the success factor collaboration comes into play.

[b] The socio-economic context – the key ingredient to match customer value and sustainability

Considering the socio-economic context and identifying the client's value drivers such as finance institutes, NGOs, or local stakeholder, facilitate sustainability integration (see code relations, figure 47, appendix D-IV-c). By pro-actively integrating these, value is created for the client, which leads to competitive advantage. Especially in countries with a low sustainability threshold, focus on costs is high. Still, even then client demands must obey to external regulations and demands i.e. stemming from financing institutes. In the cases, this effectuated as follows:

- the MZ case drew the client's attention to external requirements of other stakeholders of which the client not that aware (quality of the EIA; S1, O7)
- the BAH case convinced the client that integrating sustainability would enhance his reputation, which was one of his key drivers given the political context (S2, T4, T5, O11)
- the NL case informed local stakeholders, who then brought forward their expectations to the client. This led to enhancing sustainability value and altering the client's demands (T6, O12, O13).

To conclude, the socio-economic context is both: a limitation due to the client's demands and willingness, but also an opportunity to exert influence. Especially, the latter is a valuable insight obtained from this research and can help contractors to strive *pro-actively* for sustainability integration.

5.3 Conclusion on the Case Studies

This chapter provided empirical evidence regarding the needed success factors for pro-actively integrating sustainability. The results – and analysis led to the distinction of seven critical success factors, containing 37 sub-success factors. These are integrated into the **C⁷ success factor model** (see in figure 27).

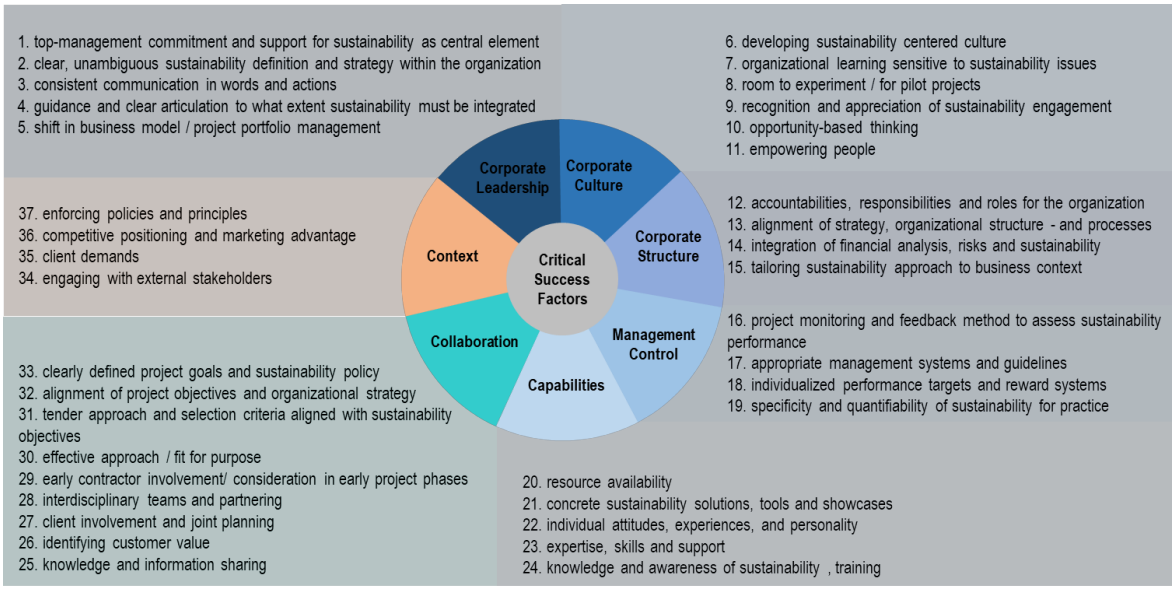
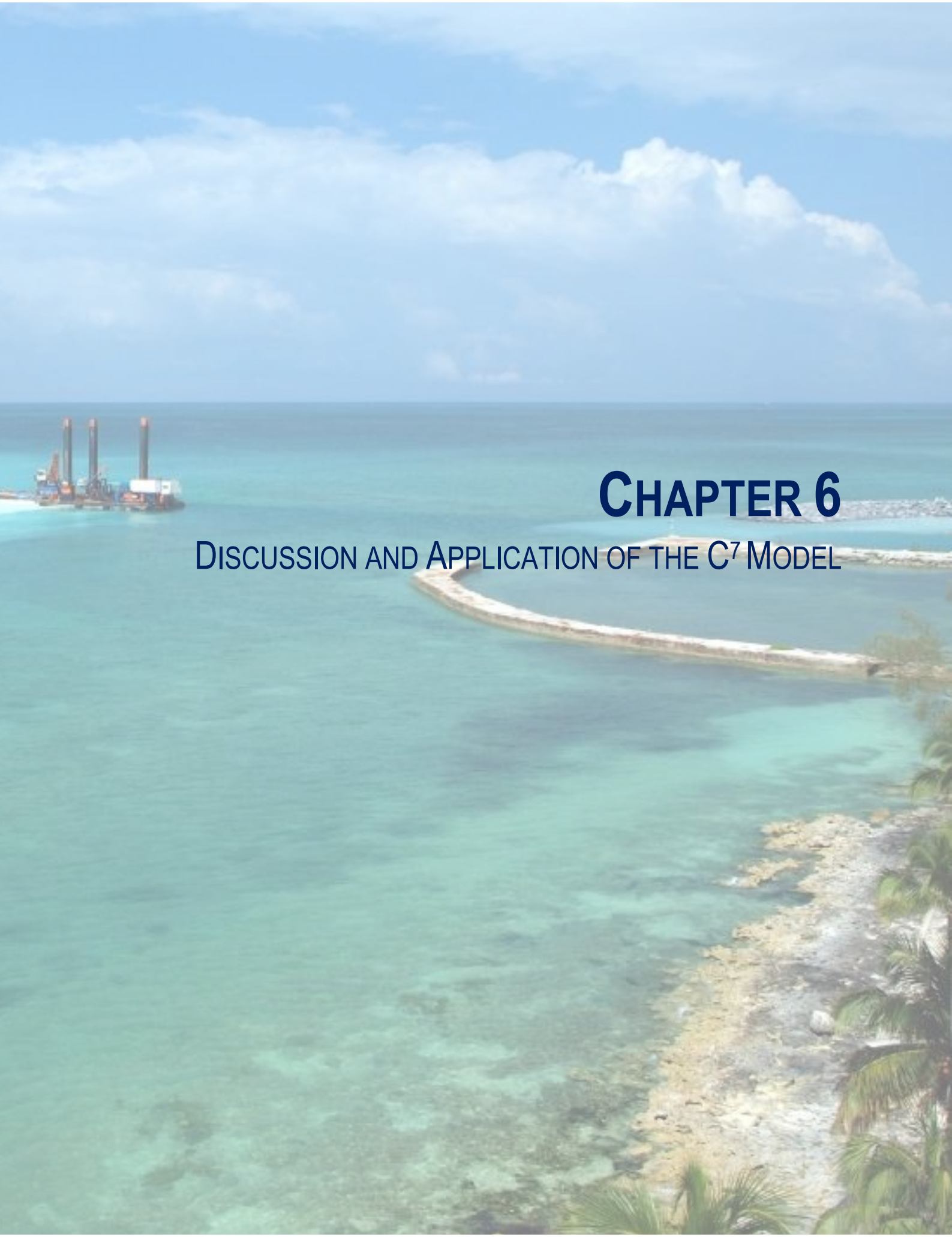


Figure 27: The C⁷ success factor model for pro-actively integrating sustainability [own illustration]

The key conclusions on the C⁷ critical success factors are:

- consistent **corporate leadership** is needed to support the change management processes of current practices, which are needed for integrating sustainability throughout the organization
- a **sustainability centred culture** features opportunity-based thinking, which supports integration beyond the client's requirements; while the (reactive) industry specific mindset remains a hurdle
- the **decentralized structure** is a key development area presently hampering success, causing fragmentation and thus requiring attention to further mature
- **management control** is needed to support change, though traditional approaches do not match the particularities – and complexities found and clash with the prevailing leadership style of the organization studied
- **capabilities** are essential and well developed, yet they must be carefully integrated to optimize their potential for achieving competitive advantage and to lessen the dependency on the competencies of one distinct manager
- **collaboration** is the central success factor for aligning internal strategy making with the external context and binds together the critical success factors found
- the **socio-economic context** constraints the contractor, but also provides a large opportunity to persuade the client of the added value regarding sustainability integration – and hence for achieving marketing advantage

To apply the model in practice, the factors are **integrated into a conceptual implementation approach**, which accounts for the different context variables – and decision-making levels. As a result, the level of control is reflected, but also the responsible action holders to enable the distinct success factors. Figure 49 (appendix V.a) shows the conceptual approach based on the results of this chapter. The approach is validated and presented in its final version in section 6.2.3.



CHAPTER 6

DISCUSSION AND APPLICATION OF THE C^7 MODEL

6. DISCUSSION AND APPLICATION OF THE C7 MODEL

This chapter discusses the results with the focus on SQ4, the applicability of the success factor model in practice. This entails an expert validation (6.1), a discussion of the case study findings (6.2.1 and 6.2.2) and the synthesis of the C7 implementation approach (SQ4, 6.2.3). Section 6.3 concludes on the chapter.

6.1 Expert Validation of the Results

This section presents the validation approach (6.1.1) and the results thereof (section 6.1.2). This is critical input to conceptualize an implementation approach for applying the success factor model in practice (section 6.2).

6.1.1 Validation Approach and Expert Panel

Validation takes place based on an expert panel discussion. The approach was chosen to facilitate group interaction and knowledge sharing across different disciplines and to trigger discussion. Besides, it has the benefit of resulting in rich data, in relatively short amount of time.

Table 15 depicts the six experts including their profiles, who were chosen to join the expert panel. The choice was limited to company internal attendees for confidentiality reasons. The experts were selected based on their expertise, their role in the organization, or their knowledge regarding the topic. A multidisciplinary set of roles was important to achieve comprehensive responses, that are meaningful to the results and implications found for project - and corporate level.

Table 15: Selection of experts for the focus group (research validation)

No.	Role	Dep./BU	Exp.*	VO**
1	Project Management/ Stage-Gate Coordinator	PROF	10	8
2	Tender Manager	NL	13	2
3	Lead Engineer Environmental	E&E	12	12
4	Risk & Internal Control Officer	FC	18	8
5	Lead PQ and Tender Support Desk	E&E	8	4
6	Manager Cost Estimating	E&E	38	38

The session was structured as follows: First, a brief introduction into the research was given, including obtaining informed consent and addressing confidentiality. The presentation ended with presenting the C7 model, which resulted from the research and the conceptual implementation approach. Next, it was asked for clarification and feedback regarding the model. Then, the experts were asked to fill in a questionnaire with the success factors found. The success factors were listed and respondents could indicate, whether the success factor is important, -or not and to what extent that factor is reflected in daily business. The questionnaire (including results) can be found in appendix V.b.

Figure 28: Interactive poll session (screenshot, real-time responses)

Finally, an interactive session took place during which 20 statements resulting from the conclusions were presented to the experts. These form the basis for the **managerial implications.**

Table 37 in the appendix shows all statements discussed during the expert panel (including their results). In total 20 statements were debated. The discussion was supported by an online tool, that enabled real-time responses to be displayed on screen for discussion. At the beginning, the statement was read out loud to the audience and the result bars were hidden. Once everyone voted, results were disclosed and talked over. Anonymous voting at first was chosen to avoid group bias.

Figure 28 illustrates an example of a statement and its options to respond (before voting has taken place). After the session, the outcome was transcribed and written feedback obtained from participants.

6.1.2 Outcome of the Research Validation

The questionnaire results of the success factor validation exercise and the discussed statements including their results can be found in appendix D-V.

[a] General conclusions from the validation session

The identified sub success factors are confirmed; no objections were brought forward regarding the categorization into the seven critical success factors. For application in practice based on the conceptual implementation approach, the allocation of success factors along the level of decision-making and their context was found to be true. Based on the discussion, it was decided to have the critical success factors not only vertically, - but also horizontally integrated for the implementation approach. This applies to *capabilities* – and *collaboration* as well as the socio-economic *context*, because the entailed sub success factors can be placed along multiple dimensions (i.e. knowledge and information sharing is important internally in the organization, but also in the project environment).

The session supported that many of the factors are not rigorously integrated yet. This validates the hypothesis, that the present gap relates to the absence of a fully integrated strategy on organizational level; in view of that, consistency has been addressed as the main issue.

[b] The semantics of sustainability

The semantics of sustainability were discussed extensively, showing that no shared understanding of the meaning of sustainability exists in the organizational context. Furthermore, respondents had difficulties to express (dis)agreement in terms of "*black-and-white*" responses regarding sustainability. Deliberately, respondents could chose *agree, disagree*, or *not applicable* regarding the statements. Respondents struggled to make such straight forward decisions, which effectuated in long voting times – and lengthy discussions. This indicates context dependency of the topic. It also underlines the complexity associated with decision-making regarding sustainability and the need to set sustainability related decisions into context.

[c] Clear communication and wording

Another general insight concerns the wording. Clear communication is a challenge as people associate different meaning to words. For instance "*guidance is required*" was disagreed on by two experts, since they understood "required" in terms of formal policy documents. Though in view of the author "required" did not refer to formal requirements, but to "the need" of guidance. To enhance clarity, this feedback was carefully assessed, leading to a change in wording, where necessary.

[d] Discussion of the success factors and their applicability

The discussion of the statements and the entailed success factors led to some crucial conclusions regarding their weight and importance for the case company. Below, only the most controversial – and important insights are discussed.

- **Opportunity-based thinking** has been a central topic to enable pro-activeness; though integrating opportunities depends on the type of tender, where merely execution offers limited room. However, given the fact, that opportunity-based thinking was continuously picked up, stresses the importance, experts associate with this factor. As hypothesized in the case studies, opportunity-based thinking in the socio-economic context becomes more important in regions, where the client needs to be convinced of the added value of sustainability. Experts confirmed this as an important means to (indirectly) exert influence on the client's demands.
- Respondents validate the key hurdle of a **misalignment between company structure, strategy and processes** (see appendix V- a). This endorses the critical role of the company structure and its impact on sustainability integration. Accordingly, decentral decision-making inhibits the lack of clear guidance, when to integrate sustainability into tenders, or when to actively look for opportunities, if the client does not ask for it. Therefore, it remains in the tender managers' judgement, whether sustainability is integrated. Besides, there are no clear roles and accountabilities within the organization for sustainability, which additionally hampers success.
- **Sustainability is still perceived as cost adding factor,** instead of an investment. Indeed, the project has to be sufficiently large, or the client willing to pay to integrate sustainability, which limits pro-actively integrating sustainability. The researcher proposed the allocation of a corporate sustainability budget to stimulate experimenting and roll-out, and to remove the dependency on the project for the starting phase of sustainability roll-out. This has been endorsed as critical and parallels were drawn to innovation, which also has its own corporate budget.
- **Management control** is amongst the least important – and least integrated factor within the organization. In turn, dynamic control is preferred, which provides guidance, while leaving sufficient room for adaptation depending on the context. While management control measures may contribute, most experts consider them too formal. Instead of rules, sustainability should become something "how business is done". While this is a reasonable assessment, the extent to which management control matters to an organization, will most likely relate to the prevailing (and preferred) leadership style. To make the success factor model also applicable to other organizations, factors associated with management control are kept in the implementation approach. Instead of seeing them as formal requirements, it could be more of a discussion, how some sort of control mechanisms can be integrated, that fit the company context.
- **Joint planning** and **client engagement** are considered essential to pro-actively integrate sustainability, but they are bound by the **client's willingness** to collaborate during the tender phase. The way, the industry presently works provides only limited room for early – and close collaboration. If the client is not willing to engage, there is little to do for the contractor, which shows, that albeit all effort contractors may put into the process, they are bound by the client. Thus, a large extent to which sustainable development can be pushed forward does not only relate

to the contractor's productive power, but also to the client's leadership in the process. Therefore, the contractor largely depends on the client's willingness in general.

- **A shift in business model** was controversially discussed. While this would ease sustainability integration, it is not easily pursued and depends on market conditions. Furthermore, it entails the question, whether to make every project more sustainable, or shift the focus towards project development. The latter bears the greatest potential to have sustainable impact. Though, no unilateral decision was made, this factor is kept in the list, under the assumption, that it would be realized at a later stage of the implementation process.

The research validation supported the validity of the success factor model in practice. Also the conceptual C^7 implementation approach could be validated. Minor changes addressed the wording of statements – and the horizontal integration of the (sub) success factors to reflect cross-context applicability of success factors. The discussion underpinned the implications drawn from the results and the conclusions on key findings. Management control is kept in the model as in view of the author, the perception relates to the company's prevailing culture – and leadership style.

6.2 Discussion of the Results

This section discusses the findings of the study. First, it is argued for the need of an integrated implementation approach to apply the factors in practice (see 6.2.1). Second, the C^7 success factors are deliberated regarding their implications for sustainability integration (see 6.2.2). Last, the validated C^7 implementation approach is presented, which helps to apply the factors in practice (6.2.3) and considers the findings from 6.2.1 and 6.2.2.

6.2.1 The Need for an integrated Approach to implement Sustainability

In view of the problem statement (see section 1.2), Sabini et al. (2019) claim the need for a systemic approach to unravel the tensions managers face in their decision-making for sustainability in projects. Therefore, the study identified three systemic aspects to consider:

[1] the corporate maturity regarding sustainability integration;
[2] the context variables; and
[3] the decision-making level.

These are considered for the implementation approach, which applies the factors in practice (see section 6.2.3). This must integrate the context dimensions (*the sphere of influence*) and the interdependent decision-making levels (*assigning responsibilities*). As a result, contracting organizations can derive the responsible action holders for enabling the success factors and understand their ability of direct control over the distinct factors. Accordingly, change is needed at corporate – and project level to achieve full maturity.

[1] The role of an organization's maturity

- **Theory:** First, in context of organizational change for integrating sustainability as a corporate strategy a maturity model was compiled tailored to the context of this study based on Epstein (2018), Machado et al. (2017), Silvius et al. (2012) and Wetzel (2016).
- **Practice:** The inconsistencies found in the case studies show, that integration has not yet reached full maturity. From the extent to which the success factors of this thesis are met, the company is mostly allocated on level two (*fragmented integration, minimizing impact*), with a shift towards level three (*seeking business opportunities*). Conversely, this implies, that the success factors need to be rigorously fulfilled to fully integrate sustainability into daily decision-making.

- **Implications:** By comparing the 37 sub success factors needed with the actual success factors met (see table 13), development areas are obtained. Based on that, the **organization can derive appropriate actions to mature to the next level**.

[2] The context variables

- **Theory:** Different context variables must be distinguished to effectively integrate sustainability (Epstein, 2018). The sphere of influence as defined in ISO (2012) decreases from internal to external, which implies less ability to control the success factors for the contractor.
- **Practice:** The success factors found can be allocated internally to the organization, in the project environment and external. Indeed, the sphere of direct influence decreases from internal to external. The contractor is constraint by the client's willingness. However, the findings show that the *external dimension* is not necessarily a threat due to lack of control, but also *an important opportunity to realize the sustainability strategy.* Especially if the client does not ask for sustainability, pro-actively bringing in the external context can help the contractor to persuade the client of the added value regarding sustainability.
- **Implications:** For integrating sustainability an *inside-out* and *outside-in* approach is needed, fulfilling success factors externally, at the interface and internally. **The distinction of different context variables denoting the sphere of influence** represents a new method compared to the theory studied. Moreover, the finding, that the external context is an important opportunity to persuade the client and to achieve competitive advantage adds to theory. Practically, this implies great potential for contractors to pro-actively integrate sustainability beyond the client's requirements.

[3] The interdependent decision-making levels and the criticality of middle management

- **Theory:** For pro-actively integrating sustainability interdependent decision-making levels require distinction: operational, tactical and strategic (Hahn et al., 2015). Besides, Frantzeskaki et al. (2012) suggest the use of a transition model for effectively aligning the different organizational levels, so that these reinforce one another. The tactical management (middle management) is key to align the strategic objectives with the project level (Too & Weaver, 2014, p. 1383).
- **Practice:** The *top-down* and *bottom up* change process was also found to be present in the case study results, where capabilities and collaboration stem mostly bottom up and corporate leadership as well as the establishment of an appropriate culture come top down. Indeed, middle management is needed to bridge the gap between strategic - and operational level. While the top is enthusiastic and the bottom level feeds in a lot of ideas, their integration is still a development area for the organization studied.
- **Implication:** Success factors must be allocated at three interdependent decision-making levels: *strategic, tactical and operational*. That way, **clear responsibilities are assigned to the success factors**, which makes the change process more actionable in practice. Middle management must align the top-down and bottom up approach. They are critical to promote change in the organization, because a lack of integration in the middle layer may lead to inconsistencies and fragmentation.

Knowing the considerations to apply the factors in practice, the next section delineates the implications stemming from the success factor model for practice. This is key input to the conceptual implementation approach and to the ensuing recommendations at the end of this study.

6.2.2 The C^7 critical success factors for integrating sustainability

Figure 29 depicts the C^7 success factor model under consideration of table 13, denoting **development areas** and **success factors fulfilled**. The corporate culture provides implications for **barriers and success factors**, while management control is **controversial** and receives particular attention.

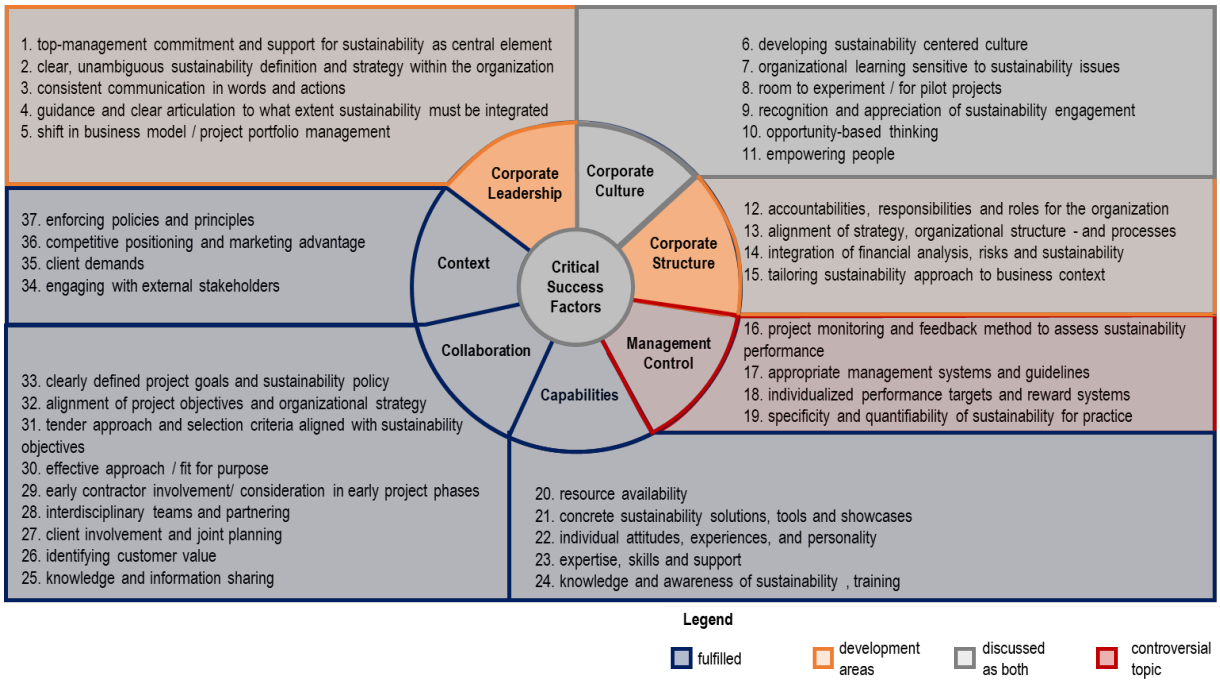


Figure 29: Illustration of development areas and critical implications regarding the C⁷ to support success [own illustration]

The structure is as follows:

First, **the barriers are discussed** and inferences for response strategies made (section 6.2.2.1). Second, **the success factors** and their effect in practice are deliberated (section 6.2.2.2). In that context, the role of **management control** is highlighted.

6.2.2.1 The Development Areas to close the Gap between Strategy Making and Project Level

The barriers and gaps relate to the non-fulfilment of the critical success factors. In other words, **barriers to successful implementation occur in the absence of the found success factors**.

This supports the criticality of the seven factors and explains, why sustainability remains fragmented and project dependant. Also, experts throughout the focus group discussion stressed "inconsistency" as a central issue to success.

Furthermore, the disparity between the case specific results and general insights (table 13, denoted in yellow) implies that every project has different standards. Accordingly, integration has not been carried out rigorously yet. The key inconsistencies and development areas identified are:

[1] the lack of consistent leadership;
[2] the decentralized organizational structure;
[3] the focus on cost efficiency; and
[4] the re-active, industry specific mindset.

At least the first three aspects relate to strategic – and middle management responsibility, implying the need for change at these levels. Table 16 summarizes the discussion in view of theory, practice and the resulting conclusions and implications to overcome these barriers.

Table 16: Summary of theory, practice, conclusions and implications regarding the key hurdles for sustainability integration

	Theory	Practice	Conclusions and Implications
Lack of consistency **(Corporate Leadership)**	• sustainability implementation calls for organizational change management (Sroufe, 2017); • the absence of concrete strategies, plans and managerial processes hampers implementation success (Baumgartner & Rauter, 2017; de Magalhães, Danilevicz, & Palazzo, 2018; Sroufe, 2017).	• perceived lack of a clear sustainability definition and its implication on daily operations • the sustainability strategy is not properly integrated into existing processes and the management system • if leaders are enthusiastic, but do not make room in their internal requirements (i.e. following up on sustainability considerations during tender review), the operational level perceives lack of clear commitment • especially, if the client does not ask for sustainable value creation, internal leadership becomes crucial	• due to the absence of a standard, the individual manager determines the extent to which sustainability is integrated; • corporate leadership must consistently demonstrate their commitment and clarify the extent to which sustainability should be integrated; also to trigger the teams to seek opportunities for sustainable value beyond the client's requirements • middle management must align the strategic objectives with the existing processes for consistently integrating sustainability
Decentralized structure **(Company Structure)**	• decentralized decision-making and fragmentation is a key characteristic of the construction sector (Dubois & Gadde, 2002; Eriksson, Leiringer, & Szentes, 2017) • the managers on project level is responsible to take the appropriate measures to execute the project in line with the objectives (PMI, 2017b, p.10; Too & Weaver, 2014)	• decentralized decision-making gives great autonomy to tenders • the tender manager is the central decision-maker regarding the capabilities needed, the extent to which risks, financing and sustainability are integrated, and the establishment of an appropriate culture on operational level • sustainability related expertise is hosted in supporting departments, which depend on the demand of tenders and projects • if the need for social and environmental expertise becomes not apparent from the tender documents, supporting departments are oftentimes consulted late • late consultation of supporting departments leads to sub-optimal effectiveness	• the relation between decentralized decision-making and the role of the individual manager has not yet been explicitly addressed in theory • those most capable are not in the decision-making power, whether sustainability should be integrated beyond the client's requirements, or not • the corporate supporting departments must be better integrated with the project level • the existing processes should ensure that the relevant knowledge integration takes place early on, and does not depend only on the manager's perception • this confirms the relevance of combining project and corporate level
Cost Efficiency **(Company Structure/Context)**	• Peenstra and Silvius (2018) suggest the client's willingness to pay as central factor for success for contractors • clients promote efficiency by rewarding the lowest price amongst the bidders (Dubois & Gadde, 2002; Eriksson et al., 2017)	• sustainability related expenses must be covered by the tender, or project budget, so that the client has to be willing to cooperate, or the project's turnover must be sufficiently large • a corporate fund can ease the integration of sustainability in the early phases, as the tender – and project become (financially) less client dependent • matching external opportunities to the client's value drivers can lead to resource sharing or changing requirements	• to make the client willing to invest, the sustainable opportunities must be matched to the customer values • if sustainability is to be deducted from the project's turnover (client not willing), it must be planned for early on to have the resources available later • a corporate budget might be useful to support the strategy integration, especially under cost constraint • there is a need to see sustainability as an investment instead of added costs for all parties involved
Re-Active mindset **(Culture)**	• focus lays on customized assets, delivered based on the client's individual requirements (Dubois & Gadde, 2002; Eriksson, Leiringer, & Szentes, 2017)	• the professional background and generation seem to have a critical impact on the prevailing mindset, which in turn affects the sustainable outcome • multidisciplinary collaboration has been found as potential means to balance this effect out, by adding further perspectives to the problem	• change is needed shifting from "Who and How" to "What and Why" • this may be supported by composing more diverse, multidisciplinary teams, along with fostering the appropriate culture

6.2.2.2 Implications of the C7 Critical Success Factors for pro-actively integrating Sustainability

The discussion of the development areas (6.2.2.1) shows, that all seven critical success factors need to be addressed to achieve full integration and to overcome present fragmentation. These are: *corporate leadership, corporate culture, company structure, management control, capabilities, collaboration* and the socio-economic *context.*

Generally, it is inferred that:

- capabilities are crucial and well-developed within the organization, yet require good integration to avoid fragmentation due to decentralization;
- collaboration is central to link the internal (corporate) – and the external context;
- the socio-economic context may be a constraint, or a chance for the contractor to pro-actively integrate sustainability.

However, two findings are discussed in depths, as they are striking, adding to theory, or differ from what would have been expected before collecting the empirical evidence. They are summarized under two themes: **opportunity-based thinking - linking the internal strategy to the external context [1]** and **the controversial role of management control [2].**

[1] Opportunity-based thinking - linking the internal strategy and the external context

- **Background:** The client initiates the project and provides the design specifications – as well as financial resources (Larsson & Larsson, 2018). Hence the client remains the dominating role in the client-contractor relationship (Eriksson et al., 2017). This explains why the socio-economic context is one of the most important success factors, which was found in both research phases of this study.
- **Problem:** The contractor has relatively little room for manoeuvre, if he merely reacts on the tender documents provided by the client (Eriksson et al., 2017). Especially in case of misalignment between the contractor's sustainability strategy and the client's requirements tensions occur, because the contractor depends on the client's willingness. Besides, what the clients asks for in the tender documents is not necessarily, what he wants, or what he needs to optimize the outcome. This can be especially challenging in geographical areas, where environmental requirements -and stakeholder expectations differ (Epstein, 2018).
- **Implication:** To pro-actively integrate sustainability, the client needs to appreciate the added value of integrating sustainability. Therefore, already in the exploratory interviews it was claimed to look for ways to exert influence on the client's demands.
- **Solution:** The *external context* helps the contractor to pursue his strategic objectives and to overcome a mismatch with the client's requirements. *Opportunity-based thinking* is the binding link between the internal strategy and the external context. Opportunity-based thinking is key as it broadens the mindset beyond requirements and entails a thorough understanding of the client, his drivers and the context. Experts confirm this as an important means to (indirectly) exert influence on the client's demands and to achieve competitive – and marketing advantage.
- **Supporting sub-success factors:** To facilitate opportunity-based thinking, several other sub-success factors come into play: *early consideration, client involvement and joint planning, taking an effective approach and identifying customer value*. Figure 30 depicts their interdependencies based on the undertaken analysis of code relations.
- **Relevance and added value for the contractor:** Opportunity-based thinking emerged from this thesis and was first found in the exploratory interviews. Case study evidence and an expert panel confirm the applicability. Therefore, it adds to present theory and supports contractors to integrate sustainability pro-actively **despite of their role in the value chain.** Besides, considering

potential relationships is an important step towards understanding the complexities of managerial decision-making, opposed to merely providing a structured list of success factors.

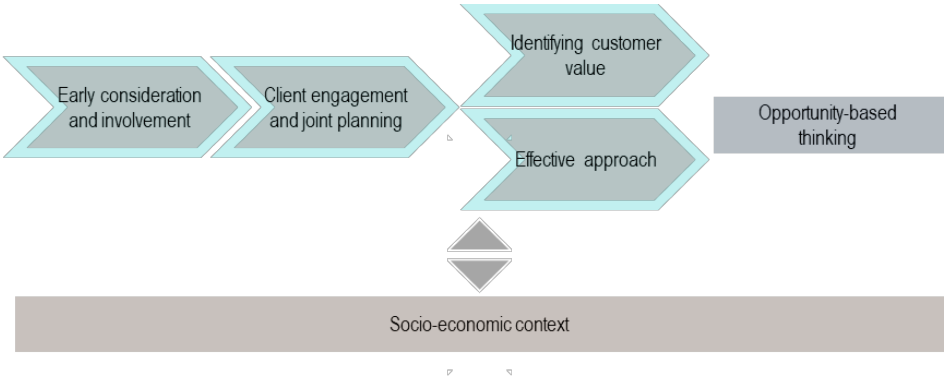


Figure 30: Illustration of interplay towards opportunity-based thinking [own illustration]

[2] The controversial role of management control

- **The findings from theory:** According to Peenstra & Silvius (2017) the non-adoption of performance measurement systems hampers success. This inclines the need to establish reporting systems to asses, evaluate and monitor sustainability processes (Agarwal & Kalmár, 2015; Kivilä et al., 2017) and requires tangible information for their inclusion into present processes (Goedknegt, 2013; Martens & Carvalho, 2017). Customized indicator systems have been developed and proved to be useful (Fernández-Sánchez & Rodríguez-López, 2010; Peenstra & Silvius, 2017).
- **The findings in practice:** Management control for sustainability integration was perceived controversial. Respondents partly demand some sort of specificity and quantifiability to enhance transparency and accelerate change. Others consider management control less important, or difficult to achieve. Accordingly, it is too formal, limiting the room for creativity and a fixed set of targets would undermine the possibility to adjust to the project context. Besides, it seems contracting organizations are driven by external targets as they must adhere to these and going beyond that could jeopardize the competitive edge. This denotes the responsibility of the wider industry to set the right - and effective targets.
- **Implications and conclusions:** Management control is kept in the model. This is because such judgement is on the one hand subjective, and on the other hand most likely related to corporate culture and preferred leadership styles. These may differ across organizations. Instead, it could be worthwhile to think of alternative control measures, which suit the agile context of marine infrastructure projects and which empower the operational level sufficiently to make their own decisions regarding the relevant targets. As such, the area of management control in the field of sustainability provides room for future research: on the one hand, how adaptive targets can be set and amended dynamically based on the project context; on the other hand, which (new) management control approaches match the different types of leadership styles.

The results **add to theory**, because they combine the corporate – with the project-based view, integrating different scales of analysis. This has not been done in 25 years of studying sustainability in project management (Sabini et al., 2019). Success seems driven internally – and externally and the findings provide a first systemic approach towards sustainability integration into (marine infrastructure) projects.

Practically, the adoption of the seven critical factors supports organizations to mature towards full integration. They constitute the needed enablers to drive implementation throughout the organization (Epstein, 2018). By comparing the success factors present with the success factors

needed, development areas can be recognised. To make the factors workable for practitioners, a conceptual implementation approach is suggested in the ensuing section 6.2.3.

6.2.3 Application of the C7 Success Factor Model – A conceptual Implementation Approach

The C7 implementation approach is conceptualized to apply the success factor model in practice. The conceptual approach entails the seven critical success factors from the model. These are integrated along the corresponding decision-making levels – and context variables in line with the critical considerations as suggested in section 6.2.1. The allocation of the critical success factors took place under consideration of the entailed sub success factors. The approach has been validated throughout the focus group discussion (see 6.1.1).

The C7 implementation approach goes beyond a structured list. From the implementation approach, contracting **organizations can derive the action holder of the success factors**. Then, upon assessing the company's maturity, the missing success factors constitute development areas and can be assigned to the responsible decision-making level, so that change becomes practicable and specific. The sphere of influence points out **where the largest potential for impact lays** and clarifies the different dimension along which success need to be obtained.

The C7 success factor model and the conceptual implementation approach allow **critical conclusions and implications** regarding their applicability in practice and the industry .

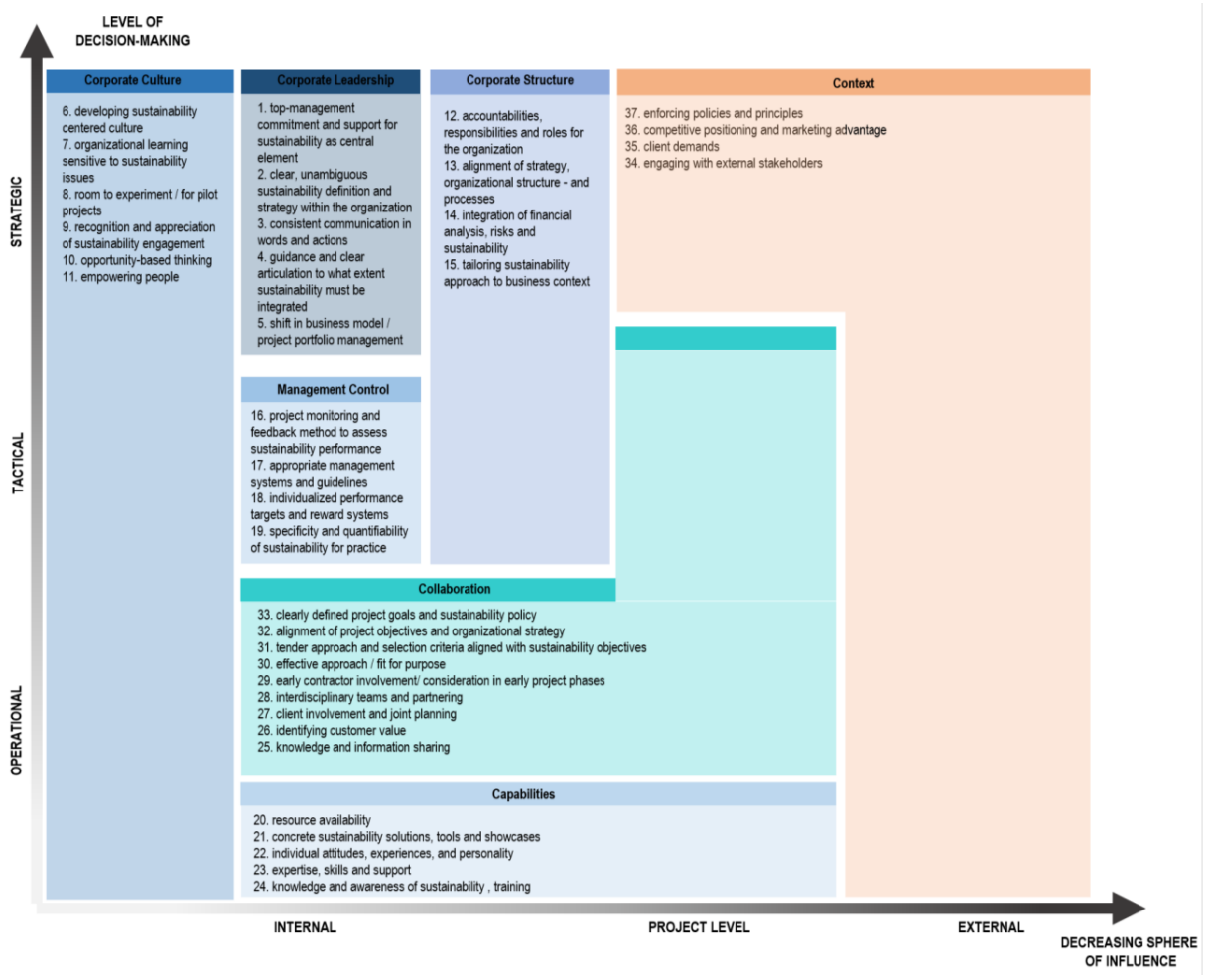


Figure 31: The C7 implementation approach for applying the success factor model in practice [own illustration]

[1] The critical conclusions

- As discussed, collaboration is central to integrate the remaining success factors across their interdependent decision-making levels – and their context variables;
- The highest density of success factors is internal, which implies a comparably large power to exert direct control; from the analysis in 5.3, it appeared, that the greatest development potential for the case organization lays in corporate leadership, company structure and management control, all of which are in the responsibility of higher-level management (internally);
- The allocation of the critical success factors across the company levels and under consideration of different scales of analysis implies that effective change requires an integrated approach; looking just at the project level does not suffice to understand managerial decision-making.

[2] The applicability of the C^7 success factor model – and implementation approach in practice

- The model – and implementation approach are expected to be applicable for other contracting organizations, featuring similar characteristics compared to the case company; as many of the identified factors are sector specific, it is likely, that they apply also to other organizations;
- The success factors must be reassessed in other company's context; the strengths and weaknesses regarding the fulfilled success factors vary – and depend on the maturity of the individual organization;
- For other industries, the C^7 model is considered sufficiently broad to be adapted according to the respective needs and particularities; the specific sub-success factors could be exchanged for those relevant to other industries;
- The C^7 implementation approach provides a conceptual guideline for applying the success factors in practice; the approach *does not* reflect the *interdependencies* between success factors (i.e. the impact of the socio-economic context on corporate leadership (strategy making), which have been *explained and discussed* in view of the success factor model in chapter 5 and chapter 6.

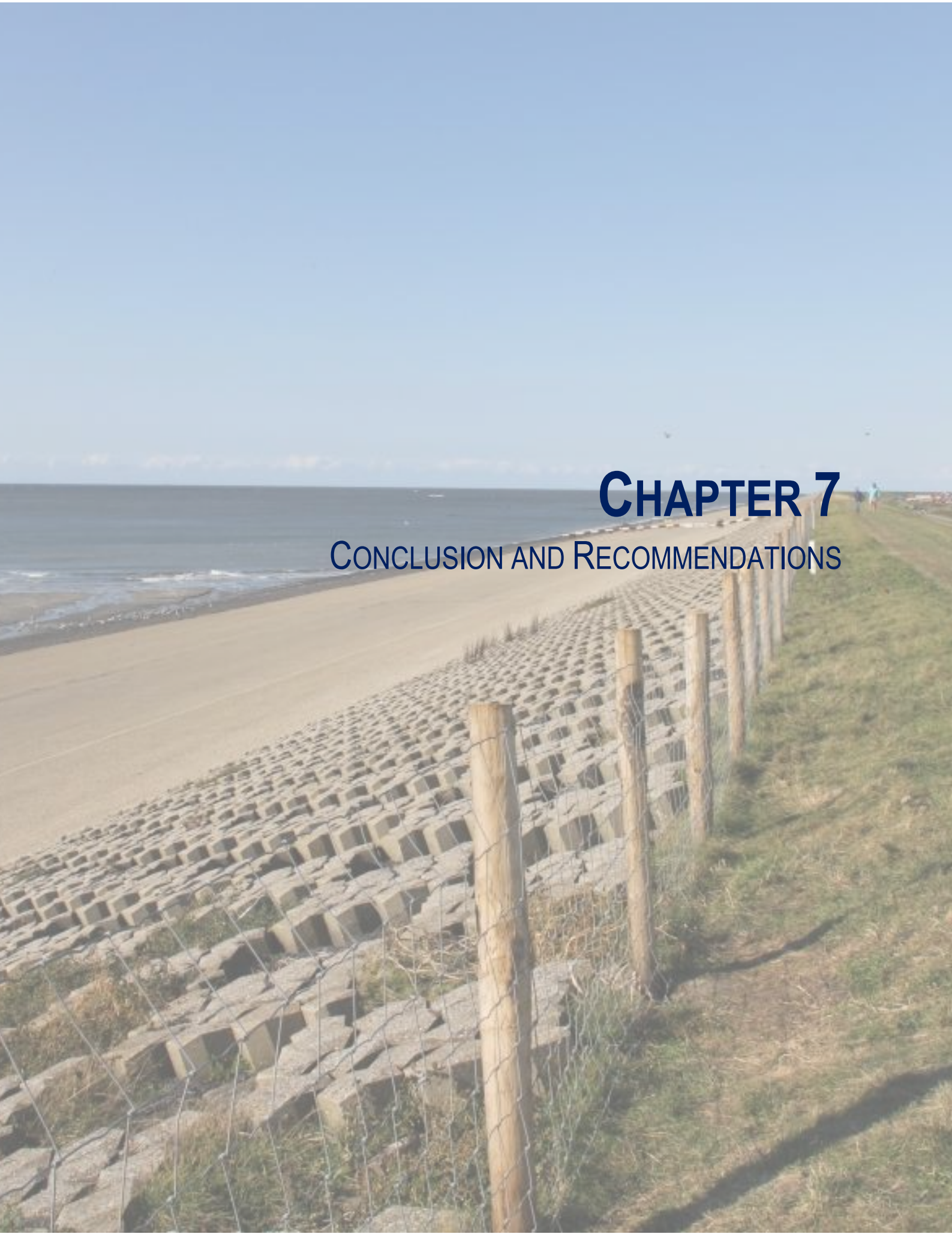
[3] The industry specific implications

- Given their role in the value chain, contractors will always remain dependent on the client's willingness to some extent;
- Especially, the willingness to collaborate during the tender phase is often limited and the focus remains on promoting cost efficiency, which altogether challenges sustainable value creation (Dubois & Gadde, 2002; Eriksson et al., 2017; Larsson & Larsson, 2018; Peenstra & Silvius, 2018)

The industry specific implications show the boundaries for the contractor, implying the need for change of the industry as a whole to promote more sustainable practices.

6.3 Conclusions on the Discussion and Application of the C^7 Success Factor Model

To mature sustainability implementation towards full integration, **the seven critical success factors of this study need to be consistently fulfilled**. These factors were integrated into the **C^7 success factor model** and subsequently conceptualized into an implementation approach to make them applicable in practice. Based on the **C^7 success factor model**, contractors can derive which success factors require further development to advance their corporate sustainability maturity. This is supported by the **C^7 implementation approach**, which allocates the factors along interdependent decision-making levels – and context variables. As a result, the success factors are not only defined, but also assigned responsibility to make change actionable. Furthermore, the context variables indicate the potential control and emphasize that change is required at all context levels. Altogether, this study presents a first conceptual attempt towards a systemic implementation approach of sustainability into projects.



CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

7. CONCLUSION AND RECOMMENDATIONS

This chapter presents the conclusions of the research. First, the research design is summarized (7.1) to subsequently answer the sub research questions (7.2). Section 7.3 answers the central research question, addressing the objective of this study. Next, possible limitations are described (7.4). The chapter ends with recommendations for future research and implications for practice referring to both, the organization studied and the industry as a whole (7.4).

7.1 Summary of the Research Design

The central objective of this thesis was to design a success factor model for pro-actively integrating sustainability into projects of marine infrastructure contractors, focussing on the tender phase. To materialize the objective, the following main research question was formulated:

CQ *How could sustainability be pro-actively integrated into the daily decision-making during the tender phase of construction contractors, operating in the marine infrastructure sector?*

A step-wise approach has been taken by distinguishing four sub-research questions.

SQ1 *What are the relevant aspects to take into account for implementing sustainability strategies?*

SQ2 *What are the causes for the gap between strategy making - and its integration on project level?*

SQ3 *What are the success factor to pro-actively integrate sustainability in the tender phase?*

SQ4 *How could a model capturing such success factors be applied in practice?*

The problem addressed is thus the disparity between sustainability strategy making - and its operationalization on project level. This provides theoretical - and practical contributions:

Theoretical Contribution: Integrating sustainability into marine infrastructure projects has hardly been studied in view of the contractor; though he pertains a central role given his productive – and innovative power to drive change. Moreover, after 25 years of research on sustainability in projects, studies lack knowledge regarding the complexities of managerial decision-making. No prior studies were found, which integrate the corporate with the project-based. Yet, both will affect decision-making. Hence, this research adds to the scientific discussion regarding sustainability in projects.

Relevance for Practice: Presently, systemic approaches to successfully integrate sustainability (strategies) into project practice are lacking. Current managerial implications from prior studies tend to remain highly contextual, so that their conclusions are barely applicable to other contexts, resulting in fragmentation and high dependency on the individual manager. To overcome this, the C^7 success factor model provides the needed success factors to integrate sustainability into daily decision-making. Furthermore, the corresponding C^7 implementation approach enables the application of the model in practice. As a result, the implications from the model become specific and actionable to drive change.

7.2 Answering the Sub-Research Questions

Bearing in mind the research design, this section answers the sub-research questions successively.

SQ1 What are the relevant aspects to take into account for pro-actively implementing sustainability strategies?

For a systemic attempt, the corporate and the project-based view need to be considered, because both influence managerial decision-making on project level.

Central aspects were the notion of *corporate sustainability maturity [1]* and the integration of the success factors along *the context variables [2]* and *the decision-making levels [3].* The main conclusions regarding these aspects are as follows:

[1] Corporate Sustainability Maturity conceptualizes sustainability in organizational context and allows an assessment regarding the extent to which sustainability is integrated. Complete integration equals the assimilation of sustainability in daily decision-making. Until full integration is reached, maturity develops from compliance, over fragmented integration towards achieving competitive advantage. Based on the success factors fulfilled, it can be derived, how mature the organization is. Factors which are not achieved are development areas. Action is needed to further advance towards complete integration. The organization studied needs to mature from fragmentation (level 2) and partially achieving competitive advantage towards consistently integrating the strategy across the organization to make it part of how the company operates (level 3 and 4).

[2] The context variables denote the sphere of control, which decreases from internally, over the project environment to externally. Success factors need to be fulfilled in all context dimensions. Contractors pertain largest control within the organization (internal). Still, contractors orientate towards the external context, which shapes internal strategy making. The external context is not only a threat (given the lack of control), but an important opportunity for pro-actively integrating sustainability. Critical value drivers of the client are allocated in the external context. By pro-actively bringing these up, the client can be convinced regarding the added value of sustainability.

[3] The decision-making levels are interdependent and comprise the strategic, tactical and operational level. The action holders for the various success factors differ based on their responsibilities across the decision-making levels. A top-down and bottom up change process is needed. The middle management plays a critical role in aligning strategy-making and project level, and hence are essential to overcome fragmentation – and thus for implementation success.

Next, to identify the development areas causing fragmentation and to subsequently derive appropriate response strategies a gap analysis was carried out. This was guided by the second sub question.

SQ2 What are the causes for the gap between strategy making - and its integration on project level?

The research showed that the barriers relate to the *non-fulfilment of the critical success factors.* Hence, barriers to successful implementation occur in the absence of the found success factors. This stresses their criticality.

Furthermore, fragmentation is reflected in the inconsistencies between the case specific results and overall business practices, which proofs that integration has not been carried out rigorously yet. Instead, sustainability integration remains project dependant.

Specifically, this research identified four major hurdles to success, which are:

[1] inconsistent corporate leadership
[2] the decentralized company structure
[3] seeing sustainability as added costs; and
[4] the industry-specific re-active mindset.

Inconsistent leadership has impact paired with the decentralized company structure, because the operational level pertains great decision-making autonomy. Oftentimes, the project level follow the client's lead and would not necessarily consider sustainability, if not required (re-active). Especially, if cost efficiency is promoted by the client, sustainability is perceived as added costs and not picked up to avoid jeopardizing the competitive edge during tendering. Derived from this are the following implications:

- To trigger sustainability considerations even in such situations, **corporate leadership** is needed. This would demonstrate managers on project level the importance of pro-actively integrating sustainability, so that **sustainability is perceived as another criteria for success for the organization**.
- This explains, why the assigned manager's intrinsic motivation determines the extent to which sustainability is integrated. In case of such **a (perceived) mismatch between the corporate strategy and the client's intention, tensions occur for managers on project level**, which need to be addressed.
- Sometimes, **it may be necessary to see sustainability as an investment**. A corporate budget can stimulate pro-active integration of sustainability by reducing possible tensions and thus support to drive change.
- A mindset shift is needed from reacting on the client's requirements with **"who and how" towards questioning "what and why"**. As a result, a more effective approach can be taken, which can trigger competitive advantage by delivering an optimized outcome, which better meets the client's needs.

Furthermore, it was found that the sustainability related expertise is hosted in the corporate supporting departments. These depend on the demand of the tenders – and projects, which implies that those most capable of assessing sustainability opportunities are not necessarily involved. To integrate the knowledge and to leverage potential opportunities, the supporting departments should be integrated better into the processes on project level. This also relates to the **company structure**.

Key to pro-actively integrating sustainability are the success factors delineated in this study and their implications. This is addressed by the third sub-question:

SQ3 **What are the success factor to pro-actively integrate sustainability in the tender phase?**

The first research phase combined theory from corporate and project management research to draw up an initial list of success factors. Paired with 12 exploratory interviews with professionals from practice, 47 sub success factors were defined. In conjunction with the aspects to consider for sustainability integration (SQ1), a preliminary implementation approach was conceptualized. This was tested based on three case studies during the second research phase.

From the case studies, a final set of **seven critical success factors (C^7)** emerged: *Corporate leadership, Corporate Culture, Company Structure, Management Control, Capabilities, Collaboration* and *the (socio-economic) Context.* These seven critical success factors entail **37 sub-success factors**, which are assigned accordingly. Figure 32 depicts the seven critical success factors along with their associated sub-success factors which are integrated into **the C^7 success factor model**.

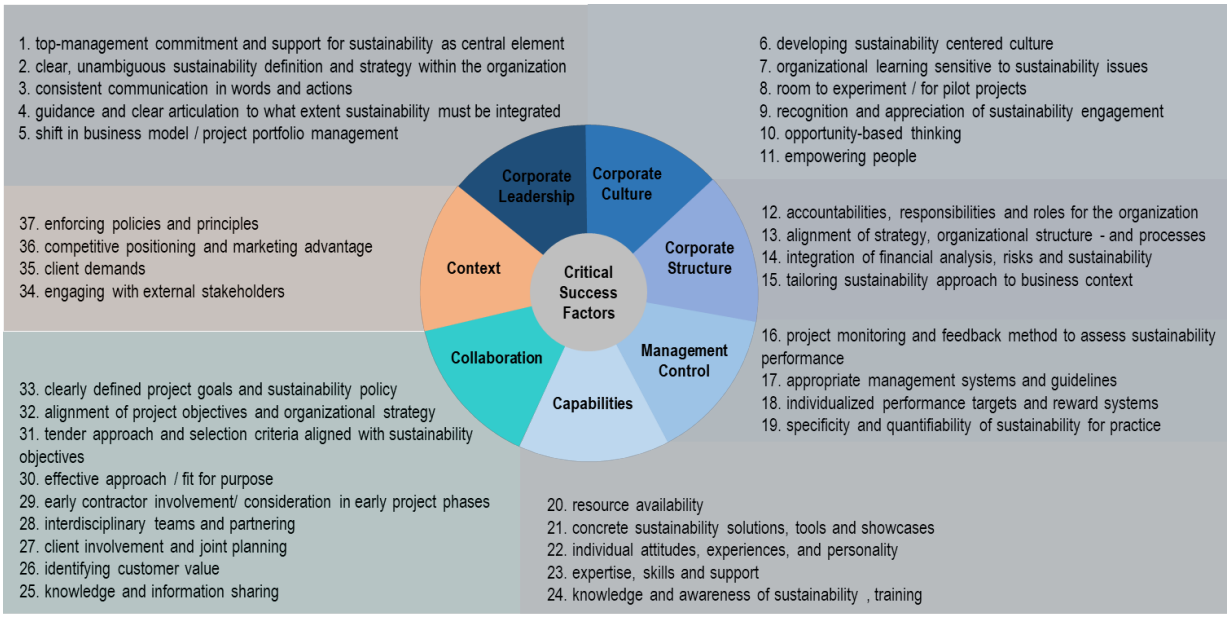


Figure 32: The C⁷ success factor model for pro-actively integrating sustainability [own illustration]

Sub-success factors are associated with the **corporate - and the project level,** confirming the need to integrate those to unravel the complexities of managerial decision-making. Overall, the seven critical success factors allow the following conclusions:

[1] **Corporate leadership** is (consistently) required, because pro-actively integrating sustainability into marine infrastructure projects requires change throughout the organization. This implies a clear sustainability strategy, a strong position in case trade-offs need to be made and expressing the importance of sustainability during tender review meetings. The latter shows that sustainability has become yet another criteria for success within the organization. In any other case, the tender team tends to follow the client's lead.

[2] **A sustainability-centred culture** is needed to assimilate sustainability into decision-making on project level. The present reactive mindset can be a hurdle to success as it considers merely the client's requirements. Conversely, for pro-actively integrating sustainability **opportunity-based thinking** is key. This broadens the mindset beyond requirements and entails a thorough understanding of the client, his drivers and the context. Subsequently, the sustainable value propositions can be matched to the client's drivers making him appreciating the resulting added value. That way, the contractor can persuade the client despite his position in the value chain. Opportunity-based thinking also adds to theory, because it emerged from this study.

[3] **The company structure** is decentralized and a key development area and a main cause for fragmentation. To overcome the associated hurdles, middle management is key for success. They bridge the gap between strategy making and realization of the objectives on project level. For further maturing towards full sustainability integration, better alignment is required. For instance, the existing company processes should integrate the strategic sustainability objectives and ensure the right competencies from corporate supporting departments are consulted early.

[4] **Management control** is needed to support change and to make sustainability more specific and transparent for its realization on project level. However, in contrast to theory, traditional static top-down approaches do not match the context, -neither of sustainability, nor of the prevailing leadership style in the organization studied. Instead, dynamic target setting is needed to account for the agile context of marine infrastructure projects and to enable a tailored approach. Besides, a bottom up tactic is needed, empowering the experts on project level to set the right targets.

[5] Capabilities are essential to achieve sustainability implementation and competitive advantage. Due to the large decision-making autonomy of managers on project level, integration of the various sustainability related expertise on corporate level must be safeguarded. Otherwise, the extent to which sustainability is considered may depend on the competencies of the individual manager.

[6] Collaboration is the binding link between internal strategy making, project level and the external context. Thus, collaboration can help to overcome misalignment between the client's requirements and the contractor's strategy. Besides, the tender documents do not always reflect, what the client really wants, or -needs to optimize the outcome. Based on early client engagement, a more effective approach can be taken and the customer values better defined. As a result, this can become part of the contractor's value proposition, leading to competitive positioning and marketing advantage.

[7] The socio-economic context does not only provide a hurdle, given the limited sphere of direct control, but also an important opportunity to make the client willing to integrate sustainability. Matching sustainability related scope to the client's value drivers is essential. By pro-actively bringing in the customer's value drivers from the external context, the contractor can exert influence on the client's demands and enhance sustainability. Examples are augmenting reputation (BAH), minimizing risks and nourishing requirements of finance institutes (MZ), or reducing local stakeholder resistance (NL).

Last, to apply the success factor model in practice, an implementation approach was conceptualized under consideration of the aspects delineated in SQ1. The leading sub-question was:

SQ4 How could a model capturing such success factors be applied in practice?

The **C^7 success factor model** is conceptualized into the **C^7 implementation approach** to operationalize the findings for practice. The **C^7 implementation approach** helps contractors to apply the success factors in practice by assigning responsibilities and denoting the potential influence over the factors.

The C^7 implementation approach was validated by experts from practice and is depicted in figure 33. The seven success factors found in this thesis are set into their corresponding context (x-axis) and are allocated across the corresponding decision-making levels (y-axis).

While the approach does not reflect the interdependencies between the critical success factors, it shows **who is responsible for enabling success** and **to what extent is it possible to exercise direct control.** Therefore, it makes the change needed actionable in practice.

Contractors can use the C^7 model to compare the performance of their organization regarding the (sub) success factors with those actually needed for full integration as proposed in SQ3. Based on that, development areas could be identified. Then, actions could be derived to realize the lacking, or inconsistent (sub) success factors. In conjunction with the C^7 implementation approach it becomes clear who is in charge to drive change (action holders are assigned) and where impact can be made.

The implementation approach shows that **a top-down and bottom up change approach** is needed, being **aligned by the tactical level**. The high density of success factors internally shows that much of the required change is under direct control and actually related to the corporate level. The greatest development areas are associated with corporate leadership, corporate structure and management control, which are in the responsibility of upper management. This again shows the criticality to consider the implications from the corporate organization to understand managerial decision-making regarding sustainability integration on project level.

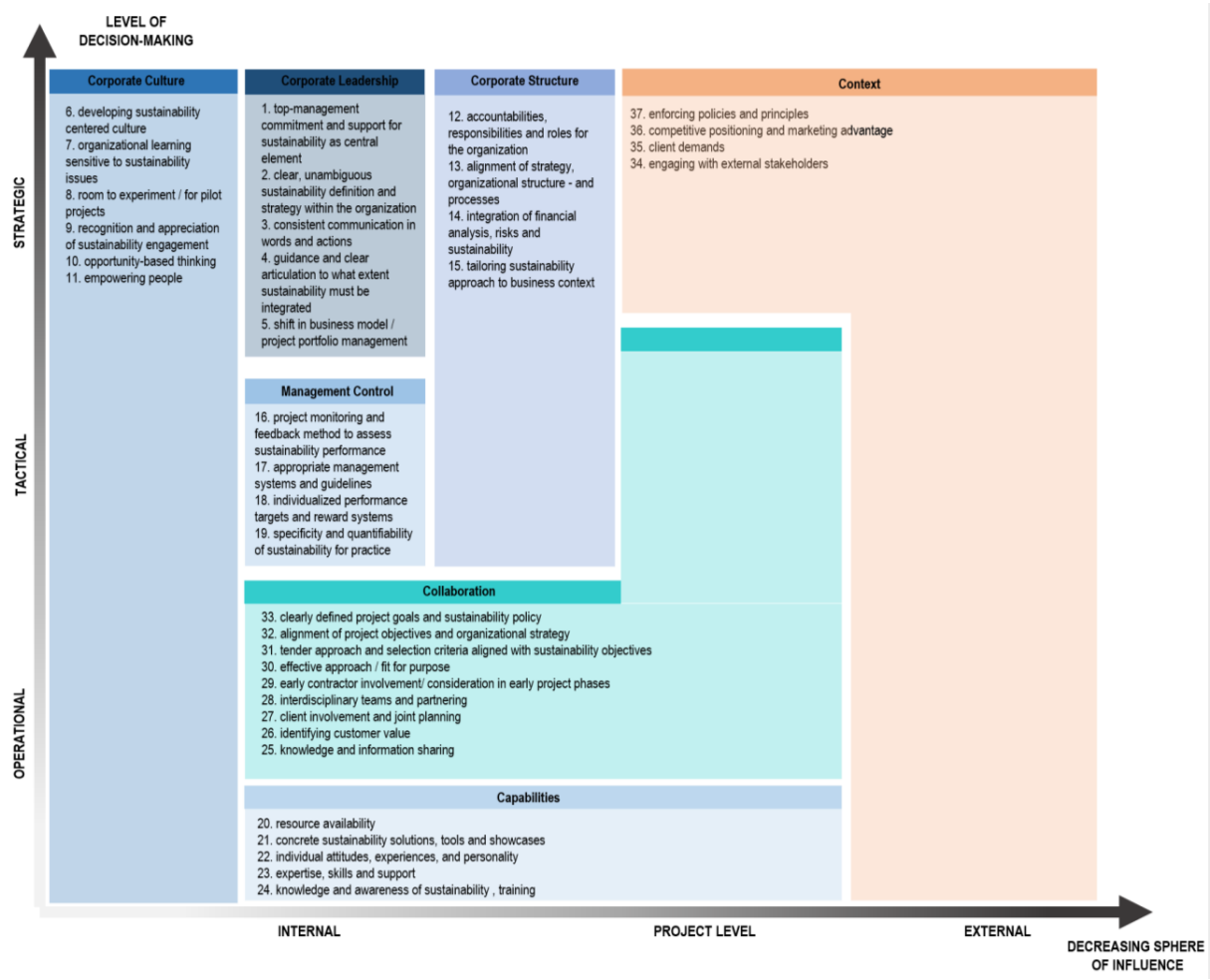


Figure 33: Concluding on the C7 success factor model for pro-actively integrating sustainability

Although consistently fulfilling the success factors may lead to full integration, the study also showed **the contractor's dependency on the client's willingness**. Engaging with the client and integrating the external context is key to pursue the own strategy. Though not every client allows this during tendering. Oftentimes, interaction is limited and the focus remains on promoting cost efficiency, which altogether challenges sustainable value creation.

7.3 Final Conclusion – Answering the Central Research Question

To accomplish the research objective, this section concludes on the central research question:

CQ **How could sustainability be pro-actively integrated into the daily decision-making during the tender phase of construction contractors, operating in the marine infrastructure sector?**

The central research question addresses the present gap between strategy making and operationalization of sustainability on project level.

It was found that sustainability could be pro-actively integrated by enabling the factors of the C7 success factor model: corporate leadership, company culture, company structure, management control, capabilities, collaboration and the socio-economic context.

Important implications are found regarding the integration of sustainability into project practice.

Managerial decision-making on operational level accounts for the project – and the corporate context. Project management alone is unlikely to flourish strategic objectives successfully, if not supported appropriately by the corporate level. Therefore, this study advocates the integration of the critical success factors along the various context variables (internal, project environment and external) for successful implementation into practice.

In (marine infrastructure) construction this holds even more, because projects are delivered – and customized to the client's requirements. As a result, the project level tends to follow the client's lead. Especially in case of a mismatch between internal strategic – and client's objectives, tensions occur for managerial decision-making on project level. This must be addressed corporately to safeguard considerations of sustainability nonetheless.

To fully integrate sustainability all decision-making levels must contribute to change. A top-down and bottom up change approach is needed. The operational level provides the necessary knowledge and expertise as input to the strategy. Corporate leadership is key to promote change and reflect that sustainability has become yet another criteria for success of organizational performance. In between, middle management is critical to align strategic – and project level to close the gap. Thus, to make change workable for practice, the critical success factors are assigned responsibilities across the organizational decision-making levels in the C^7 implementation approach.

Opportunity-based thinking overcomes hurdles associated with the contractor's position in the value chain. Accounting for the dominant role of the client, opportunity-based thinking and integrating the client's value drivers from the socio-economic context is essential. By matching sustainability related scope to the client's value drivers, it is possible to implement sustainability beyond the client's requirements. That way, the contractor can persuade the client despite his position in the value chain. This is an important, new finding of this research, thus adding to theory.

The client's willingness will remain a considerable constraint to add sustainable value. The necessary *early engagement* to enable opportunity-based thinking and identifying customer value is not always possible under present tendering conditions. If the client is not willing to collaborate, or to integrate the necessary expertise, it becomes difficult to optimize the sustainable outcome for the contractor. Therefore, it is also task of the industry to promote more effective ways of collaboration and to drive change towards more sustainable project practices.

To conclude, the contributions regarding the problem statement are:

- **For Science,** this study unravels critical strains in managerial decision-making for sustainability on project level, which thus contributes to the scientific discussion thereof.
- **For practice,** the findings have the potential to go beyond highly contextual implications, though being derived from marine infrastructure context. This is because the seven critical success factors may provide guidance to other contracting organizations regarding the variables to consider in order to implement sustainability strategies on operational level.
- **For science and practice,** the *conceptual* C^7 implementation approach tackles the need of an integrated systemic approach, which was claimed to be missing. It helps contractors to apply the (sub) success factors of the model in practice. The development areas (not, -or inconsistently fulfilled factors) can be derived and subsequently actions can be taken to close the gaps. This is specified and actionable given the assigned responsibilities and the defined sphere of influence.

7.4 Limitations of the Research

As any research, the study must be considered in light of some limitations. Four key themes are identified, which possibly pose limitations to the outcome. These are related to *the lack of previous research on the topic* [1], *generalizability [2], data collection* [3], and *the occurrence of biases* [4].

[1] Lack of previous research on the topic

To the knowledge of the author, no prior research addressed the implementation of sustainability strategies into projects, combining project - with corporate considerations on decision-making. Also, the perspective of the contractor has hardly been studied. While this explains the explorative approach of this thesis, it implies, that the theoretical foundation was constraint.

[2] Generalizability

Generalizability may be challenged due to the in-depths approach. This is less threatening for the purpose of this study (practice-oriented), but would be important to contribute to theory. To enhance generalizability actions were taken. An embedded *multiple case study* approach was deployed. Besides, findings were validated by an expert panel for its general applicability in practice. For confidentiality reasons, only experts from VO were consulted. Comparing empirical evidence with concepts from theory indicates alignment, supporting transferability.

[3] Data Collection

A strategic case sample enabled meaningful results. Besides, to obtain maximum information under time constraint, interviewees were chosen strategically. This supported materializing the research objective, but it may imply **"selection bias"**, meaning that the units of analysis are not representative for the overall population. This type of bias could not be ruled out, as the purpose was to specifically look at projects, which pro-actively integrated sustainability. Given the industry's dynamics, this in itself is a rarity. In view of the author, this limitation is acceptable due to the practical insights gained from the study.

Next, the scope of this research was limited to the **tender phase**. The importance – and priorities of success factors may vary during other project phases. Besides, the conclusions draw on the **contractor's perspective.** Other actors across the value chain may feature different success factors and have different perceptions regarding the integration of sustainability.

Last, the strategic respondent for the NL case was inaccessible. This inconsistency was accepted as the tender manager of that case is also experienced in the role of an area manager, so that he could provide a thorough understanding of both perspectives.

[4] Occurrence of Biases

Albeit the collection of descriptive knowledge, case studies focus on interpretation. Therefore, biases may occur. These can be related to the researcher – or to interview respondents.

- **Observation bias** can occur, because the study relies on the researcher's own observation and orientation. This limitation is difficult to rule out, particularly because cases of different cultural contexts have been studied. To minimize the effect, extensive validation and feedback have been gathered and triangulation was used, which would make incongruities apparent.
- **Interview responses** are challenged by several types of bias: respondents might be selective in their memories; they might attribute positive outcomes to their own organization; or they might exaggerate the events. Interviewing at least four actors per case, formulating questions to obtain descriptive knowledge and using triangulation minimized the impact to a reasonable extent.

7.5 Recommendations for Science and Practice

From the limitations, recommendations for further research are derived (see 7.5.1). Furthermore, the recommendations and implications for practice are presented, divided into Van Oord specific (7.5.2) and the industry as a whole (7.5.3).

7.5.1 For Science and Future Research

To **further validate this exploratory study**, the following is suggested:

- testing the applicability of the seven critical success factors and their sub-success factors in other contexts (i.e. other contracting organizations, or cross-industry with similar characteristics such as the process industry), or quantitative validation by surveying organizations across the sector
- how precisely the different decision-making levels interdepend to subsequently advance the discussion of the conceptual C^7 implementation approach and its applicability in practice
- research distinguishing different scales of analysis (i.e. project context, corporate context and markets) to support the findings of this thesis and to further understand the complexities of managerial decision-making across context levels
- further studies are needed to validate prioritization of factors in view of the organizations maturity, so that the change over time is better understood and success factors assigned accordingly
- a dedicated study on the correlations of success factors is recommended, as this study discussed interrelations of success factors but further validation is needed to advance the discussion
- studying other project phases would enable a fully integrated success factor model and provide implications regarding the similarities and disparities across the project life cycle (content-wise, or in importance)
- studying other actors within the value chain to fully understand the industry's actor system

Second, **to contribute to the overall body of knowledge**, the following topics could be researched:

- the traits, which define a sustainability centred organizational culture
- the impact of intergenerational collaboration to drive cultural change for sustainability
- the impact of leadership style on the choice – and effectiveness of management control systems;
- the design of dynamic management control systems that suffice the complexities of sustainability (adaptive), but is practical, easily implemented and empowers experts on bottom level to set the right targets;
- the effect of diverse, and multidisciplinary teams in the early project phases on spotting opportunities and enhancing sustainability related value.

7.5.2 For Van Oord

For Van Oord, recommendations are given in line with the seven success factors of the model. Figure 34 presents the proposed actions, prioritized over time to make actions realistic and timebound. The indication of time horizons serves as an orientation. Furthermore, the corresponding decision-making levels are indicated (as identified in this thesis) to make change actionable.

The **added value** of this research for the company is a thorough analysis of the present implementation gap, which identified the development areas towards achieving full integration (see table 13). The findings challenge the current approach by showing the inconsistencies between project – and corporate level. The C^7 implementation approach helps Van Oord to assign responsibilities to action holders for enabling success factors and reflects their potential influence, depending on the context.

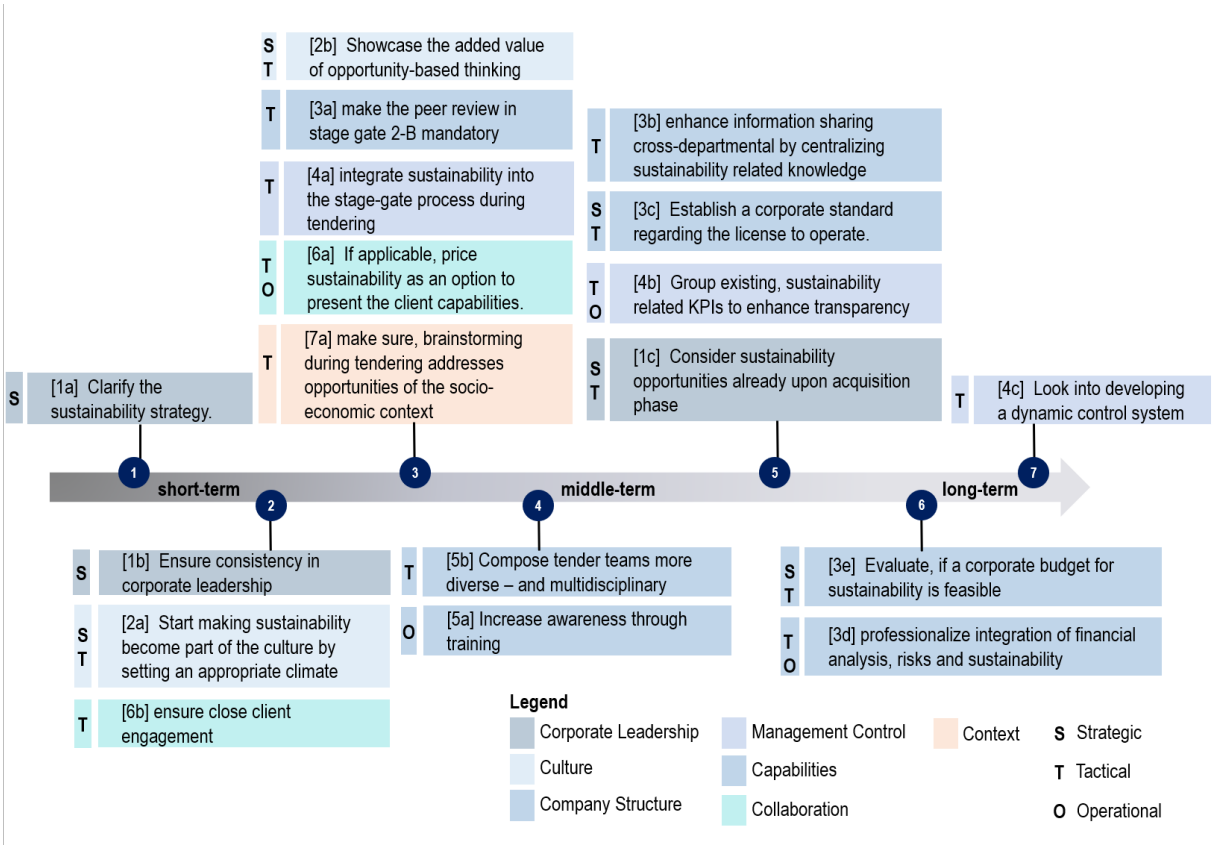


Figure 34: Illustration of practical recommendations for Van Oord [own illustration]

The recommended actions, their underlying background - and implications are explained more in detail below. The structure follows the seven critical success factors.

1. Corporate Leadership

[a] *Clarify the sustainability strategy* in easier terms to stimulate a shared understanding. Before presenting the sustainability framework, add in a sustainability definition, which expresses the meaning of sustainability regarding the scope of work VO conducts. Thereby not only focus on the product VO delivers, but also *how* they are delivered.

[b] Safeguard consistency in corporate leadership and express clear commitment by *questioning – and following up sustainability related issues during tender review meetings.* Ensure, sustainability is perceived another success criteria next to productivity, price and equipment.

[c] Consider sustainability opportunities already upon acquisition phase. Project governance entails a strategic *choice of projects in line with strategic objectives.* Besides, commercial actors could more pro-actively visit clients and make them aware of their opportunities for project development. A shift in business model is depending on the maturity of the market and at this state not realistic any time soon.

2. Corporate Culture

[a] Set *an appropriate climate*. Empowering people, recognizing and appreciating sustainability engagement are key motivators for change, thus may be used to drive change.

[b] *Showcase the added value of opportunity-based thinking* to make people aware of the added value. Focus in brainstorm session also on sustainability opportunities. Analyse i.e*. strengths, weaknesses, opportunities and threats* to stimulate creativity and connect ideas to the broader context.

3. Company Structure

[a] Integrate corporate supporting departments better into the processes of the early project phases, so that they can provide input and opportunities are recognized. For instance, *make the peer review in stage gate 2-B mandatory* for projects above a certain threshold and by critically questioning the responsible mangers, whether they consulted the relevant expertise.

[b] Consider to *enhance information sharing cross-departmental by centralizing sustainability related knowledge* via an integrated coordination point. This has the further advantage of providing an overview regarding, what is going on in the various departments.

[c] Establish a *corporate standard regarding the license to operate*. For instance, take the IFC and establish minimum requirements to be integrated into the management system. Importantly, leaders must follow up to ensure compliance. As the IFC is formulated broadly enough, this still leaves sufficient room for adaptation. Even in developing countries, these guidelines apply (due to financiers), so that reflecting its integration into corporate guidelines *can even be a differentiator for the client.*

[d] *Professionalize the integration of financial analysis, risks and sustainability* to make the added value of sustainability more transparent and to have the possibility to directly translate it to cost reduction for the client. Also, finance institutes take a risk based approach regarding social and environmental impact, so it helps the client to bridge the gap and acquire financing. This is an opportunity for competitive advantage.

[e] Evaluate, if a *corporate budget for sustainability* is feasible (for the initial phase of the roll-out). As also the corporate budget depends on project's turn-over, it could be worthwhile to set up partnerships i.e. applying for subsidies such as for RVO, who support firms contributing to SDGs, or to combat child labour with funding.

4. Management Control

[a] Align the strategy with the corporate processes. *Integrate sustainability into the stage-gate process during tendering*, such as a reminder between stage gate 2A/2B to trigger discussions and to express corporate commitment (even if the client is not asking for it).

[b] *Group existing, sustainability related KPIs* to enhance transparency.

[c] Look into *developing a dynamic control system*, in which tender and project teams can assemble their own set of KPIs applicable to their context. That way, enough room and empowerment to let those best capable to make the right decision is left, while ensuring this topic is dealt with. For the future, this is a means to establish continuous improvement.

5. Capabilities

[a] Provide *training to middle management and key decision-makers* on tender level to enhance awareness

[b] Compose *tender teams more diverse – and multidisciplinary* to enhance competencies and knowledge integration. The similar profile of team members (age, gender, professional background) could slow down a change in mindset; conversely, adding different perspectives resulted in richer outcome

6. Collaboration

[a] If applicable, *price sustainability as an option* to present the client capabilities.

[b] *Ensure close client engagement* to find out the client's underlying interests and values.

7. The (socio-economic) Context

[a] Be aware and integrate the socio-economic context and match sustainable value proposition to the client's drivers. Use recommendation [2b] to support this.

7.5.3 For the Industry

This section provides recommendations and managerial implications for the industry as a whole. Implications were found regarding the contractor, the client, financiers, regulators and the wider community.

For contractors:

- take a top down and bottom up change approach: safeguard ownership and commitment by leadership, integrate ideas and expertise bottom up and ensure middle management actively aligns strategy making and project level
- critically examine your organization's sustainability maturity and prioritize actions accordingly to close potential gaps (for instance with the help of the success factors found in this research)
- make sustainability a success criteria for the organization, so that it is considered in managerial decision-making even if clients do not ask for it
- focus in project acquisition on composing a project portfolio, which provides sustainability opportunities and on getting involved earlier (i.e. project development phases)
- look for opportunities in the socio-economic context to match sustainable value propositions in line with the client's value drivers, this may lead to competitive advantage
- to become less dependent on competencies of the individual manager on project level, be aware of decision-making autonomy (decentralized company structure); better integrate expertise from corporate level into tenders – and projects to foster informed decision-making
- support a mindset shift from reacting to requirements towards questioning the ultimate objective of the client to pursue an effective approach (from "who and how" to "what and why").

To effectively drive change, action is required from other actors too. Present industry practices constraint the contractor. This has implications for the client, financiers and regulators.

For the client:

- involve expertise from contractors earlier, preferably in the front-end engineering; otherwise changes and optimizations are difficult to achieve; conversely, this helps to avoid late changes, or sub-optimal outcomes;
- choose the tender approach so that engagement with contractors is possible, especially for high impact activities; presently, contractors can hardly bring in their knowledge during tendering
- tender approaches must safeguard value maximization instead of short-term cost efficiency; if the value is not appreciated by the client, change becomes difficult for the contractor

For other, external actors

- **financiers** have a critical role to promote change; they are needed for most major infrastructure projects and their lending requirements are a powerful tool to promote change
- **regulators** must provide a global standard, that is *adhered* to; this must establish fair and equally applicable conditions for competing; besides, focus is on minimizing negative impact, while maximizing positive impact should be equally addressed in guidelines and frameworks to allow value maximization

Last, it is important to keep in mind, that:

> "*There is no power for change greater than a community discovering what it cares about.*"
> (Wheatley, 2002, p. 55)

Ultimately, it should be the responsibility of **everyone** to care about the world's future, to address this and to thereby promote change at scale.

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APPENDICES

A. Literature Study

I. Keywords Problem Exploration

Table 17: Literature search for problem statement

	Web Of Science	Scopus	Science Direct
sustainability **AND** project management	5864	8853	2895
sustainability **AND** project management **AND** contractor	94	170	35
sustainability **AND** project management **AND** marine infrastructure	11	18	6
sustainability **AND** project management **AND** dredging	10	22	14

N.B. Upon reviewing the abstract and contents, even those papers found were not necessarily useful to the problem in this research.

II. Results - List of Sustainability Sub-Success Criteria

Table 18: Sustainability success criteria compiled from literature study [own work]

	Core Topics	Sub-Criteria	Aarninkhof et al. (2018)	Gijzel (2014)	Wu, Qiang, Zuo, Zhao, and Chang (2018)	Martens & de Carvalho (2014)	Martens et al. (2016)	Silvius, Gilbert & Schipper (2012)
Economic Sustainability	Return on Investment	Financial performance				✓		✓
		Cost management				✓	✓	
		Value generation	✓	✓		✓		✓
		Cost effectiveness	✓		✓			
		resource efficiency		✓				✓
	Business Agility	Sustainable business opportunities				✓		✓
		Innovation management				✓	✓	
Environmental Sustainability	Energy	Energy Use / efficiency	✓	✓	✓	✓	✓	✓
		Emission/CO2 from energy used	✓	✓	✓	✓	✓	✓
		use of renewables	✓	✓	✓			
	Water	Water use and quality		✓	✓	✓	✓	✓
		water recycling						✓
	Waste	Waste generation	✓	✓	✓		✓	
		Recycling and Disposal						✓
	Materials and Resources	Pumping distance and speed	✓					
		Materials management	✓					
	use of land	Nature development within or near the project	✓					
		Selection of project location	✓					
		Soil quality and management	✓		✓			
		biodiversity	✓	✓	✓	✓		

	environmental impact	Noise emission	✓	✓	✓		✓	
		Environmental policies	✓				✓	
		Environmental reports	✓			✓		
		climate adaptation		✓				
		multifunctionality	✓	✓				
		Compliance with legislation	✓			✓	✓	
		Environmental education and training				✓	✓	✓
Social Sustainability	**labour practices and ethical behaviour**	Occupational health and safety	✓	✓				✓
		Supplier and contractor relationships		✓		✓		✓
		Organizational culture management					✓	✓
		stakeholder relations	✓	✓	✓	✓	✓	✓
		diversity				✓		✓
	Societal Impact	Stakeholder engagement	✓	✓	✓	✓	✓	✓
		Relationship with the surrounding community	✓			✓	✓	✓
		Financing of social actions				✓	✓	
		Owner and user satisfaction	✓		✓			

III. Explanation of the Research Strategy for the Success Factors

The literature study is based on unstructured literature sampling to obtain a preliminary overview of the research field, followed by a structured literature search. Upon clearer problem definition, the latter was employed to target the appropriate literature for assembling a preliminary list of sustainability barriers – and enablers and to establish an adequate framework for the model. As multiple, different concepts have been investigated, the search strategy will briefly introduced hereafter.

To assemble a success factor model for the case of project-based corporations operating in marine infrastructure sector, various input variables have to be taken into account depending on the context. For an initial exploration of the topic, snowball logic, meaning accessing references of references and testing combinations of keywords has been applied. Additionally, literature-based discovery was used to explore, whether a similar problem has been solved in another industry (Fellows & Liu, 2015, p. 67).

To obtain "relevant, valid and reliable information" (Fellows & Liu, 2015, p. 66), it is important to structure the literature search (Fellows & Liu, 2015, p. 64). Triangulated research, listing relevant authors, theories and topic keywords can support a structured review. Particularly the list of keywords should be limited in size (Fellows & Liu, 2015, p. 64). For gathering rich results, synonyms were included and keywords connected, using Boolean operators within the search ("AND", "OR").

Because this research integrates the corporate – and the project-based view in the context of marine infrastructure construction, success factors for the implementation of sustainability are retrieved from literature of different nature: authors, with a corporate perspective **[1]** as well as with a project-based perspective **[2]** and "hybrid" references, which address both, sustainability implementation within projects and possible implications for the corporate organization **[3]**.
Publications were retrieved from three main databases: *Scopus*, *google Scholar* and *Web of Science* as they feature the key publishing institutes such as Emerald, Elsevier, Springer, Willey, Taylore & Francis, and JStor. To limit the review to an appropriate extent, initially, the search was restricted to publications not older than 2012, as one of the key authors for sustainable project management published a book tailored to the context of the study at that year. Given the fact, that sustainability is a fairly new, emerging topic , focus lays on more recent publications. However, from the initial exploratory stage, references older than 2012 were identified and considered valuable for the purpose of this thesis, and hence included. The table, which lists the references used to derive an initial list of success factors can be found on the subsequent page. The table indicates author, year, title and publisher as well as an indication into which of the three author groups it belongs ([1], [2], or [3]).

IV. Sustainability Success Factors – Literature Review List

Table 19: List of literature for compiling theoretical success factor list

	Author	Year	Titel	Journal / Publisher
corporate organization	Engert & Baumgartner	2016	Corporate sustainability strategy–bridging the gap between formulation and implementation	journal of cleaner production
	Epstein	2018	Making sustainability work: Best practices in managing and measuring corporate social, environmental and economic impacts	Routledge
	Kronfeld-Goharani	2018	Maritime economy: Insights on corporate visions and strategies towards sustainability	Journal of Ocean & Coastal Management
	Brones et al.	2017	Reviews, action and learning on change management for eco-design transition	journal of cleaner production
	Kuhmar & Rahman	2015	Sustainability adoption through buyer supplier relationship across supply chain: A literature review and conceptual framework	international strategic management review
corporate organization / project management	Munyasya & Chileshe	2018	Towards sustainable infrastructure development: drivers, barriers, strategies, and coping mechanisms	Sustainability
	Hwang et al.	2018	Adoption of sustainable construction for small contractors: major barriers and best solutions	Journal Clean Technologies Environmental Policy
	Zhang et al.	2018	Drivers, motivations, and barriers to the implementation of corporate social responsibility practices by construction enterprises: A review	Journal of Cleaner Production
	Aarseth	2017	Project sustainability strategies: A systematic literature review	International Journal of Project Management
Project management	Peenstra & Silvius	2018	Considering sustainability in projects: exploring the perspective of suppliers	IJISPM- international journal of information systems and project management
	Mavi & Standing	2018	Critical success factors of sustainable project management in construction: A fuzzy DEMATEL-ANP approach	journal of cleaner production
	Banihashemi et al.	2017	Critical success factors (CSFs) for integration of sustainability into construction project management practices in developing countries	international journal of project management
	Matar et al.	2008	Sustainable construction management: introduction of the operational context space (OCS)	construction management and economics
	Bakar et al.	2009	Project management success factors for sustainable housing: a framework	conference paper
	Tamak	2017	Use of critical success factors in an integrated project management model to improve the chances of project success of a sustainability oriented highway project during the exploration and planning phase	master thesis
	Silvius et al.	2012	Sustainability in project management	Gower Publishing

V. Sustainability Success Factors – Selection Process

The list of factor list has been reduced and altered in comparison to the found factors to tailor the list for the purpose of this study.

Some 'success factors' such as '*water and noise pollution minimization*' have been excluded as these are in the author's view rather assessment criteria than enabling factors. Also '*sustainability reporting*' has been excluded as this has been considered a tool to assess sustainability rather than an enabling factor. Besides some factors such as '*internal and external communication*' as well as '*awareness of project external factors*' have been excluded as they were considered collective terms, entailing further sub-factors, which would need to be further specified. Moreover, '*systemic planning'* has been excluded as good planning should be the baseline assumption for any project management attempt, as otherwise one would not talk about project management (see definition, 2.3). Last, '*the client pays for sustainability*' has been removed as it was only mentioned once. However, it is considered implied in '*client and stakeholder demands*', as especially in project context, the client's demands specify the requirements, which are in turn reimbursed based on the deliverables. However, albeit having removed these factors from the preliminary list, it does not exclude their consideration, if they appear throughout the case studies.

Other success factors have been compiled into one category as they were having the same implications, but were named differently by the authors. Table 20 provides an overview, along with a list of the excluded factors as explained above.

Table 20: Summary of alterations regarding success factors in comparison to literature

excluded from the list
• water and noise pollution minimization
• sustainability reporting
• internal and external communication
• awareness of project external factors
• systemic planning
combined, or merged
• 'interdisciplinary' and 'multidisciplinary' teams
• 'emphasizing sustainability in project portfolio management' and 'shift in business model'
• 'authority and responsibility given to project team' and 'distributed leadership'
• 'trust and commitment amongst partners' and 'constructive relationships'
• 'stakeholder approach' and 'engaging with stakeholders'
• 'multifunctional implementation team' and 'creating clear roles, and accountabilities'
• 'clearly defined project goals and scope' and 'clearly formulated project sustainability policy'
• 'lesson's learned' and 'information / knowledge sharing'

B. Company Review

I. Actor – and Stage Gate Review

Phasing of the tender Process

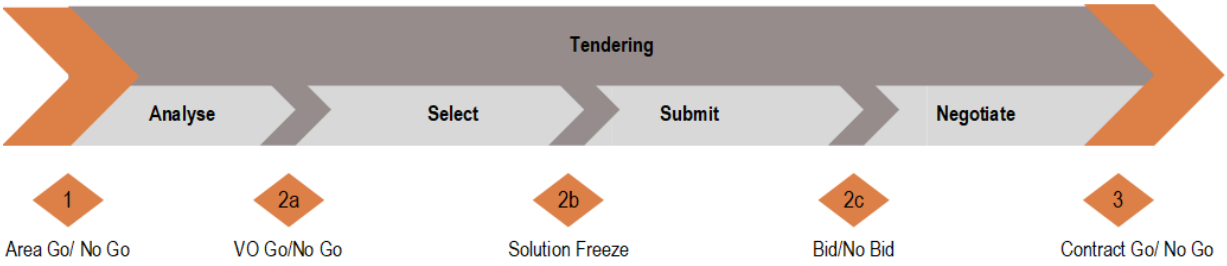

Figure 35: Stages of the Tender Phase [own illustration]

Table 21: Description of stage-gate phases during tendering

[1] Analysis Phase
• starts with stage-gate 1 (end of acquisition phase), which is the area go/no-go decision to tender in order to focus on tenders with high potential; • utilizes a clear vision on behalf of the area-, or business unit manager regarding the decision to tender; • decision for a tender approach is made by the tender manager, the area director and the staff director of E&E • The main actor responsible for the analysis phase is the tender manager • Central to this stage is unravelling the client needs, a focus on the competitor's strategies and how to differentiate as well as channelling capabilities to leverage strengths • Ends with stage-gate 2 a, the Van Oord Go/No-Go decision (the tender management plan), which determines the strategy to win based on a tender approach
[2] Selection Phase
• tender team is established, based on the tender management plan • aims at selecting a design-, execution-, and equipment solution • A brainstorming session brings together the different expertise at hand to generate various solutions • feasible solutions will be further elaborated by the use of a trade-off matrix • ends with freezing one solution (stage-gate 2b)
[3] Submission Phase
• Starts with the decision to bid • should avoid unfruitful tender applications, that are either impossible to execute, or not sufficiently profitable • the risk profile of the projects is central to ensure a pro-active risk approach • the profit mark-up and win strategy are formulated • ends with stage gate 2 c, the decision to bid
[4] Negotiation Phase
• Determining, whether the contract will be signed by Van Oord • monitoring – and implementing negotiated changes to the contract document • tender manager prepares the hand-over file • introduction of project manager to start preparation of the realization phase • results in stage gate 3, which determines the contract go/no-go decision • key milestone of the negotiation phase is the contract award

Summary of Tasks – and Responsibilities of Actors during Tendering

The tables below describe the tasks and responsibilities of the actors involved in the tender phase. The various actors are categorized according to their level of decision-making.

Strategic Level

Table 22: Directory team

Directory Team		
Area Director	**Department:** BU	**Reports to:** Business Unit Director
Activities and tasks: • Actively contributes to development and implementation of Van Oord strategy including the preparation and execution of a three year business plan • Accounts for market development when approving annual plans as drawn up by area managers and provides leadership to area managers • oversees the project managers and therefore ensures optimized qualitative and commercial results		
Staff Director E&E	**Department:** E&E	**Reports to:** Executive Board
Activities and tasks: • to meet long-term objectives, he oversees the creation – and implementation of the business plan from the perspective of his department • develops and implements Van Oord's strategic objectives, the business plan to ensure long-term continuity • Interprets Van Oord's policy and subsequently, draws up and implements annual plan under consideration of legitimate investment proposals • Oversees optimization processes within the department and guides, develops and assesses own staff structures in line with Van Oord personnel and organization policy so that quality – and quantity of personnel are optimized		

Tactical Level

Table 23: Tactical management of tender process

Management Team		
Area Manager	**Department:** BU	**Reports to:** Area Director
• Activities and tasks: • to achieve turnover and profit targets, area manager oversees the acceptance – and execution of projects in the assigned area under consideration of Van Oord's strategic objectives • he requests the project/ tender manager based on competencies from the Crew Manager from the Personnel & Organisation Department and/or the Manager Operations from the Operations Department, which in turn provides the required personnel for the project/ tender team • Scope of work: responsible for adherence to the safety regulations and for the application of the Van Oord Management System, contributes and implements VO strategic objectives, prepares and implements annual plans, maintains and expands relationships and networks		
Manager Production Estimating	**Department:** E&E	**Reports to:** Staff Director E&E
Activities and tasks: • Oversees the preparation of working methods and production budgets in cooperation with the Manager of Cost Estimating. • Also oversees the carrying out of soil research and the production related training of office and fleet staff in line with the Engineering & Estimating annual plan, thereby contributing to the optimization of production processes • Prepares and implements annual plan for production estimating • Oversees the analysis of tender documents and the drawing up of the working method and availability of materials in accordance with production calculation norms and in consultation with the Manager of Cost Estimating, in order to ensure that the best possible production estimates can be drafted for tenders		
Manager Project Planning and Risk	**Department:** E&E	**Reports to:** Staff Director E&E
Activities and tasks: • Understands the general scope of the work (tender/project) and approves/declines requests from a tender manager (TM) / project manager (PM) for a risk engineer (RE) • assigns the appropriate risk engineer to the tender teams • Approves the project risk management team's scope of work; ensures compliance with VO procedures, work instructions and risk management practices and reviews and signs off the documents issued by the risk engineer		

Manager Cost Estimating	**Department:** E&E	**Reports to:** Staff Director E&E

Activities and tasks:

- Based on the production estimate, the cost estimate is drawn up by the cost estimator
- The manager of cost estimating oversees the cost estimators working on tenders and is responsible for all cost estimates under his supervision

Operational level

Table 24: Operational level within tender process

Tender Team		
Tender Manager / Engineer	**Department:** E&E	**Reports to:** Staff Director E&E

Activities and tasks:

- The tender manager coordinates the area, E&E and the supporting staff department during the project tender phase and is responsible for continuous improvement and innovation
- Overall, he is responsible for the content, completeness and quality of the bidding documents
- *Scope of work*: tender management plan, assembling, inspiring and leading the team, implementing the strategy to win, responsible for document control system, collection of tender requirements, distribution and sharing of tender documents via the reading matrix, tracking tender process, controlling adherence to the tender schedule, organizing the kick-off and other progress meeting within the tender team, organizing stage gates 2B and 2C, recording the minutes from meetings and their distribution

Cost Estimator	**Department:** E&E	**Reports to:** Manager Cost Estimating

Activities and tasks:

- Draws up an economically and technically sound cost budget for tenders

Advises the area management on this subject in line with the relevant 'Internal Management Office Instructions' in order to be able to present the customer with a complete tender that can lead to the acceptance of a project

Production Engineer	**Department:** E&E	**Reports to:** Manager Production Estimating

Activities and tasks:

- Responsible for carrying out the assigned estimation tasks for the tender
- He prepares the project production file, finalizes the estimate and subsequently transfers the estimate to the cost estimator

Risk Engineer	**Department:** E&E	**Reports to:** Manager Project Planning and Risk

Activities and tasks:

- central role in project teams of complex and multidisciplinary tenders and projects with a helicopter view
- responsible for identifying and analysing risks and opportunities (e.g. technical, financial, contractual or planning risks), that may affect the achievement of project objectives
- delivers the risk register, the risk report, compiles lessons learned from past projects

II. Exploratory Interviews – Interview Protocol Sample

Introduction

- **Introducing myself**

Interview Nº.:	Date:	Start:	End:
Interviewee:		Recorded [yes/no]:	

  - Master student CME studying at TU Delft; originating from Hamburg, Germany with a background in civil engineering
  - master thesis regarding sustainability integration into existing project management practices with the focus on the stage-gate process

- **What is the purpose of the interview**
  - The thesis objective is to provide a structured approach to integrate pro-active sustainability into decision-making, more specifically during the project tender phase by the means of designing an implementation success factor model (**scope**)
  - The interview is conducted in context of the conceptual framework for the later case studies and serves as **input for**:
    - Identifying key roles and actors, which matter for my subsequent research
    - Providing input for the conceptual framework
  - **Key topics**, which I will address:
    - The meaning and understanding of sustainability in the concept of Van Oord
    - The decision-making in tender/ project management
    - The gap between corporate level and sustainability integration on project level

- **Confidentiality and use of data**
  - **Anonymity** of the information provided will be ensured, information should not be traceable back to you
  - Can I **record** the interview to focus on what you stay, as making notes may distract us both? This will help me transcribe the content. I ensure **not to share the record** without your admission. (Do not assume to have to ask anyway).

Main Part of the Interview

- **Tell me a little bit about yourself**
  - what is your **background** (profession, role within VO)
  - work **experience**: how long have you been working in your profession / for van Oord
  - what is your **expertise**, or area of **interest**

- **conceptualize sustainable project management for VO**
  - **Defining sustainability**
    - How do you define sustainability?
    - what is **pro-active** sustainability; [distinction to **license to operate]?** *showing image sustainability framework as presented in figure 14 to explain*
    - would you say there is **clarity** regarding the **definition** and **use** of sustainability, in which way?

  - **Analyze features and drivers of the tender phase**
    - Competition
    - Assessment criteria / quality / opportunities and synergy
    - **Silos /** lack of integration and communication/ sharing knowledge
    - How is it ensured, that all **knowledge is on board** during **tender design**?
    - Who are **key roles?**

- **Delineate root causes for existing implementation gap**
  - **Currently applied management processes – the stage gate process**
    - In which way does the **stage gate process influence decision-making?** (does stage gate process **trigger sustainability** considerations?)
    - Please, tell me about the **acceptance and adherence** to the stage-gate process. Is it followed, or what is its purpose in your opinion?
    - Which elements would you add to **the stage-gate** process and what could be further developed (especially for sustainability)

- **Challenges for roll-out of sustainability on project level**
    - Related to VO **organizational structure** (project-based organization; matrix organization)
    - Incentives and reward schemes
    - Institutional barriers (communication, fragmentation/ silos)

- **Integration enablers – what is required to integrate sustainability**
    - Culture of awareness
    - Motivational aspects
    - Communication and knowledge sharing

- **What are the recommendations for my research**
  - **Focus areas, general recommendations**
  - **Key actors** and knowledgeable persons
  - In preparation for the **case studies: exemplary projects**

Closing the Interview

- Provide **contact** information
- Provide quick! Overview of **following steps**
- Offer to **send the transcript** of the interview

III. Outcome Theory and Exploratory Interviews – Success Factor Synthesis

Five Factors Reduced

[1] 'distributed leadership'

- as in allocating responsibility adequately, has not been mentioned explicitly, only implicit in the context of *empowering people*.

[2] 'clear roles and responsibilities within the team'

- 'Clearly defined roles and responsibilities' is implicitly assumed in the success factor having clear roles assigned.

[3] 'commitment to sustainability from project stakeholders'

- can be assumed in entailed in the factor 'client and stakeholders demands'

[4] 'constructive relationships amongst stakeholders'

- considered the container term for knowledge exchange and collaboration.

[5] 'competent project team'

- is the sum of multiple factors addressing competencies of the project team i.e. 'knowledge and awareness'

**Importantly, removing these factors from the list now does not imply, that they are excluded from the case studies if they reoccur at a later stage.*

Seven additional Factors from Practice

[1] early contractor involvement/ consideration in early project phases
[2] effective approach / fit for purpose
[3] opportunity-based thinking
[4] defining focus areas
[5] concrete sustainability solutions, tools and showcases
[6] internal sustainability programs and initiatives
[7] room to experiment / for pilot projects

Two Factors from Theory only

[1] life cycle analysis and design for the environment
[2] clearly defined project goals and scope including sustainability policy

C. Case Study Preparation

I. Exemplary Case Study Protocol

1. Overview

Mission and Goals (case study sponsor -and research):

Background

- Project Context

Key Data – and Characteristics

- Project Name, Location (Area/ BU)
- Client
- Scope; Role in the Value Chain (i.e. sub-/ or main contractor)
- Project size (measured in contract volume?)

Mission & Goals

- Of the project as a whole and of VO

Case study questions, hypotheses and propositions:

- *Guiding – SQ3 and SQ4:*
  - What are the success factors to pro-actively integrate sustainability in the tender phase?
  - How could a model capturing such success factors be applied in practice?
- As important **input** serves the hypothesized *preliminary success factor model*, which has been synthesized based on literature study and company review (incl. interviews)
- Also validation of conclusions from literature study – and company review regarding SQ1,2,3

Rationale for choosing the case:

2. Data Collection Procedures

Names and contact details

- Informants with short communication ways
- Sampling of key interviewees

Data collection plan

- sampling of interviewees
- documents to review (listing)
- data collection schedule (interview appointments)
- Case study preparation (information to be reviewed, interview preparation - procedure for informed consent and other issues i.e. preparing necessary forms and lists as templates)

3. Protocol Questions

Sustainability in the project

- In what way was this project sustainable? (check against sustainability criteria)
- Who contributed to the sustainability? (Decision-makers leading to the outcome)

Success Factors for sustainability

- What were the triggers for sustainability consideration?
- Which of the success factors were present in the project process compared to research preliminary model of research phase I?
- Are there new factors, dominating factors, or irrelevant factors compared to theoretical framework?
- Is it possible to prioritize the factors?

II. Document Summary

The document summaries were filled in upon document review. In the data base, they were stored named in line with their document name – and index number in the following manner: *Case-Name_Index-Nº* for example MZ-A refers to document number A of the case study in Mozambique. The reference to the document summary is also included in the table of reviewed documents (see I).

Table 25: Document summary template after Miles and Huberman (1994, p. 55)

Document Form – Case:		
Document Name:	**Document Index Nº.:**	**Date reviewed:**
Associated Event/ Contact: **Relevance to case study:** **Brief summary of contents:**		

For confidentiality reasons,
the case study description is excluded from publishment

Table 26: Case study - overview of project sustainability sub-criteria

	Core Topics	Sub-Criteria	MZ	BAH	NL
Economic Sustainability	Return on Investment	Financial performance	✓	✓	✓
		Cost management	✓	✓	✓
		Value generation	✓	✓	✓
		Cost effectiveness			✓
		resource efficiency	✓		✓
	Business Agility	Sustainable business opportunities		✓	✓
		Innovation management		✓	✓
Environmental Sustainability	Energy	Energy Use / efficiency			✓
		Emission/CO2 from energy used			✓
		use of renewables			
	Water	Water use and quality	✓	✓	✓
		water recycling			
	Waste	Waste generation	✓	✓	✓
		Recycling and Disposal	✓	✓	✓
	Materials and Resources	Pumping distance and speed	✓		✓
		Materials management	✓	✓	✓
	use of land	Nature development within or near the project		✓	✓
		Selection of project location	✓	✓	
		Soil quality and management	✓	✓	✓
	environmental impact	biodiversity	✓	✓	✓
		Noise emission	✓	✓	✓
		Environmental policies	✓	✓	✓
		Environmental reports	✓	✓	✓
		climate adaptation			✓
		multifunctionality			✓
		Compliance with legislation	✓	✓	✓
		Environmental education and training	✓	✓	✓
Social Sustainability	labour practices and ethical behaviour	Occupational health and safety	✓	✓	✓
		Supplier and contractor relationships			
		Organizational culture management			
		stakeholder relations	✓	✓	✓
		diversity	✓	✓	
	Societal Impact	Stakeholder engagement	✓	✓	✓
		Relationship with the surrounding community		✓	✓
		Financing of social actions	✓	✓	✓
		Owner and user satisfaction		✓	✓

Table 26 above has been compiled based on the data and documentation retrieved and reviewed and further completed upon information from the case study interviews.

For the MZ case, energy use is difficult to determine, as the case is still in preparation. Besides, given the focus on the tender phase, not much information was retrieved regarding the supplier relationships. Organizational culture management was not addressed in the distinct cases, given their focus on the distinct tender/ project. Water recycling has not been addressed in any case, which is logical as it is not a central element in the scope of works. Albeit these limitations, the cases satisfied the extent of **pro-actively** integrating sustainability for the purpose of this study.

II. Reviewed Documents – Case Studies

Table 27: Data collection overview - document list

ID	Document Name	retrieved from	received	created
MZ-A	A_20151202_workshop-socio-economic_and_environmental-aspects	VO	05-06-19	02-12-15
MZ-B	B_Environmental Impact Assessment (EIA)	https://s3.amazonaws.com/-rgi-documents/79cf7f90a31a4ca6f57-cc664b26f860aaca71ac4.pdf	11-06-19	02-2014
MZ-C	C_Stage-Gate_2-c_Meeting (Bid/ No-Bid)	VO	12-06-19	16-11-15
MZ-D	D_tabulated_ESMP_EnvironmentalRisks (Annex EIA)	http://www.mzlng.com/pt/Responsabilidade/Gesto-ambiental-e-social/Avaliao-do-Impacto-Ambiental/	12-06-19	02-2014
MZ-E	E_ESIA	https://www.afdb.org/en/documents/document/mozambique-mozambique-lng-rap-summary-109043	26-06-19	26-04-19
MZ-F	F_Contract-Mng-Plan	VO	28-06-19	20-09-16
MZ-G	G_Client-Sustainability-Presentation	VO	28-06-19	19-05-15
MZ-H	H_Tender-Management-Plan	VO	28-06-19	15-12-17
MZ-I	I_Tender-Brainstorm-Session	VO	28-06-19	17-12-15
MZ-J	J_Routing	VO	28-06-19	21-12-15
MZ-K	K_Tender-Evaluation	VO	28-06-19	03-05-16
MZ_L1	L1_Environmental_Complicance-Matrix	VO	28-06-19	27-02-18
MZ_L2	L2_HSE_Compliance_Matrix	JV Partner	28-06-19	27-07-18
MZ_M	M_Environmental-Mng-Plan	JV Partner	28-06-19	19-12-17
BAH-A	A_Project-Proposal	VO	20-05-19	14-01-14
BAH-B	B_Preliminary-Design	VO	26-06-19	26-06-13
BAH-C	C_Coral-Reef-Rehabilitation	VO	15-06-19	06-06-13
BAH-D	D_Employers-Requirements	VO	15-06-19	13-01-14
BAH-E	E_Travel-Instructions	VO	15-06-19	23-06-15
BAH-F	F_Completion_Certificate	VO	15-06-19	23-01-19
BAH-G	G_Leaflet_Environmental-Aspects	VO	05-07-19	20-09-18
NL-A	A_Final-Report	VO	12-07-19	02-02-16
NL-B	B_Reference-Letter	VO	29-06-19	12-11-19
NL-C	C_Eco-Shape	https://publicwiki.deltares.nl/display/BTG/Sand+nourishment+-+Hondsbossche+Dunes%2C+NL. Retrieved: 02-07-19. 08.00.	02-07-19	N/A
NL-D	D_Tender-Submission	VO	18-07-19	28-06-13

III. Case Study Interview Protocol

Please note, this is the case study interview protocol as prepared; though in some interviews the conversation emerged, so that the order of testing the factors as presented here was changed. Respondents covered multiple factors in one response, as they explained the cases. The aspects tested remained the same though and in such cases, the protocol served as reminder, if everything has been touched upon. This was to enable interviewees to explain the topics in the order they felt comfortable with and to avoid an "artificial" question-answer interview.

Interview Nº.:	Date:	Project:	Start:	End:
Interviewee:			Recorded [yes/no]:	

Case Study Interviews

Part 1 - Introduction

- **Introducing myself**
  - Master student CME studying at TU Delft; originating from Hamburg, Germany with a background in civil engineering
  - master thesis on how to integrate sustainability into the decision-making in projects of marine infrastructure (focus on tender phase)

- **What is the purpose of the interview**
  - The thesis objective is to design a success factor model to integrate pro-actively sustainability into the decision-making of marine infrastructure projects, more specifically during the project tender phase (**scope**)
  - In a first step, a list of prospect success factors has been drawn up based on theory and practice (exploratory interview), which are now tested based on case studies
  - This interview will help me to validate the presence of certain factor to allow conclusions regarding their importance for sustainability integration
  - **Key topics**, which I will address:
    - The sustainability initiatives in the project
    - The circumstances, which led to sustainability integration

- **Confidentiality and use of data**
  - **Anonymity** of the information provided will be ensured, information should not be traceable back to you
  - Can I **record** the interview to focus on what you stay, as making notes may distract us both? This will help me transcribe the content. I ensure **not to share the record** without your admission.

Part 2 – Testing the Success Factors in the Project

Background – and general information

Please, can you tell me briefly about yourself: what was your role in the project?

From what stage on, were you involved in the process, and who involved you?

Are there clear roles – and responsibilities within Van Oord, which take care of sustainability? If so, which roles and to what extent did you encounter their participation in this project? (And if not, why not) **#OS7**

Project Background

What was the sustainability policy in the project (i.e. in the winning strategy, or as part of the project goals), if any? **#PO30**

In what way do the project goals align with the sustainability strategy of Van Oord? **#PO31**

What were the reasons for contract award, and what was VO strategy to win compared to competitors? *Follow-Up: Which role did sustainability play to differentiate?* **#M39**

What was the tender approach and the selection criteria? How d*id they align with sustainability?* **#R41**

What role did laws, policies and regulations play regarding sustainability aspects in the project? **#R38**

Were there other stakeholders, or client demands, which enforced sustainability, if so which? **#R40**

Sustainability Guidance and developing the sustainability Initiatives

Where there clear expectations regarding sustainability, that you had to fulfil in the project? **#LE2**

Follow-Up: Was there any guidance to what extent sustainability must be integrated (from within Van Oord/ from the client)? **#LE4**

In which way did you experience support from your VO superiors regarding a pro-active sustainability approach? **#LE1**

In what way does the management system provide guidance towards more sustainable decision-making? **#MC12** Follow-up: Would more guidance be beneficial for the overall integration?

At what stage were you as a contractor involved in the project and what were your opportunities in the early phases to have an impact on the project design? **#COL42**
Follow-Up: What role does the early consideration of sustainability play regarding the success of its implementation?

What were the opportunities in the project that could be leveraged? **#MQ44**

What were the concrete sustainability tools and solutions, that could be integrated? In which way did this ease sustainability implementation? **#PR46**

In what way was the design optimized towards a more sustainable alternative, or a more effective approach? **#MQ43**

Collaboration Aspects

Which role did joint planning play regarding sustainability play in the project and how important was this for the sustainability outcome? **#COL34**

Which impact did the fact of engaging with the different stakeholders have on the project? **#COL37**

In which way was the client involved in the early planning phases / tender phases and is this relevant to sustainability? **#COL35**

In what way are the suppliers in line with sustainability objectives? **#COL36**

Managerial Aspects

In what way was sustainability quantifiable/ made tangible in this project? ***#PR16***

By what means is sustainability performance assessed (if any)? **#MC11** *If none: What role do indicators play?*

What influence did the consideration of sustainability had on to the cost estimate (if any)? ***#HFC18***

How were the sustainability initiatives integrated into the overall cost estimation of the project? ***#PR15***

- *Tell me about the role of sustainability regarding the risk costs, did it influence the risk profile of the project and how was it considered?*

What resources were deemed necessary to consider sustainability in this project? And were these available? Did this have an impact? **#HFC20**

The project team

How experienced was the tender team regarding sustainable projects? **#MQ22**

- Were there different backgrounds and expertise present in the tender team, in what way? **#PO33**
- What was the general knowledge and awareness? **#MQ27**
- *What* role played training and knowledge? **#MQ25**

In what way was sustainability engagement encouraged, and did you observe any impact? **#MQ24**

How was information – and knowledge shared, and to what extent were other departments involved? Did this facilitate the sustainability initiatives? **#C28, 29**

Do you think, that it is important to have room to experiment with sustainability / pilot projects? If so, could you provide an example from the project? **#HFC48**

Zooming-Out to Overall Organization

In how far does the sustainability strategy align with the corporate strategy? **#OS8** *What are potential conflicts and trade-offs?*

Is there change required to align the VO business model with the intended sustainability strategy? What change would be required? **#HFC21**

Do you think the sustainability strategy is consistently communicated in word and action and what is the importance to do so regarding the success of sustainability implementation? **#LE3**

In your business unit/ department is there a tailored sustainability approach, which accounts for the needs of your typical clients? **#OS9**
Follow-Up: Have focus areas been defined, if so which? **OS#45**
What role does the organizational culture play, and how does this influence sustainability considerations? **#LE5**

In what way are performance targets linked to the corporate strategy, is there something similar for sustainability? **#MC13**

What impact do such reward systems have on more sustainable decision-making? **#MQ23**

Can you name examples of environmental – and or social incidents occurred in the past, which have changed the attitude towards sustainability (for instance an oil spill leading to bad reputation etc.)? **#OS6**

Part 3 - Closing the Interview

- Provide **contact** information and quick overview of **following steps**
- Explain, that I will **send the transcript** of the interview for verification

IV. Case Study Results and Analysis

a. Success Factor Alterations

Compared to the preliminary framework, the case studies lead to the following alterations:

- **Combining factors:** In total, nine success factors are merged, combining redundant responses. For instance, *cross departmental interaction* is implied in *interdisciplinary teams* and *information and knowledge sharing*.
- **Excluding factors:** *Supplier auditing* is excluded from the list, as at tender stage not considered relevant by respondents. A closer look at the supply chain is recommended though, especially after contract award. Data collection did not provide sufficient insight to draw relevant conclusions.
- **Validation of new factors from exploratory interviews:** For all six factors, which were added to the list from theory, empirical evidence was found, strengthening their relevance in practice. Additionally, project size, professional background and generation were found to be affecting existing success factors.
- **Specifying factors:** *Using other success criteria than short term profit alone* has been modified and labelled *identifying customer value*, as this specifies the means by which other success criteria are determined in all three cases, though not explicitly stated by the client in the tender approach, or requirements.

Table 28: Overview of adaptations compared to conceptual framework

excluded from the list
• Supplier auditing
combined, or merged
• *'cross departmental interaction'* is implied in '*interdisciplinary teams'* and '*information and knowledge sharing'*
• '*project monitoring and feedback methodology to assess performance*' and '*use of performance indicators'*
• '*individualized performance targets and reward systems*' with '*decision making linked to strategic objectives*'
• '*LCA and design for the environment*' merged with '*effective approach*' (responses address the same aspects)
• '*defining focus areas'* is entailed in *'guidance and clear articulation to what extent sustainability must be integrated'*
• '*cost reduction*' is considered a driver rather than a success factor and would be addressed by '*integrating financial analysis, risks and sustainability*'
• '*sustainability related initiatives and programs*' entailed in '*showcases and tools*'
• '*capacity building and development*' is considered the container term for the success factors assigned to '*capabilities*'
• *'Joint planning, partnering and cooperation'* is considered entailed in '*interdisciplinary teams'* and *'client involvement and joint planning'*

b. Quantitative Analysis of Case Study Results

Section b of appendix D-IV presents the quantitative results regarding the success factors as explained in section 3.2.3 and applied in chapter 5.

Cumulative results of frequency segmented coded – Case comparison and decision-making levels

Figure 39: From left to right: Relative importance of success factors per case [a]; Cross case comparison of importance per success factor [b]; Comparison of decision-making levels [c] (illustration: MaxQDA)

Detailed overview of responses given by interviewees

Figure 40: Detailed overview of responses regarding frequency of coded segments (illustration: MaxQDA)

Code Relation Networks – Corporate Level (internal)

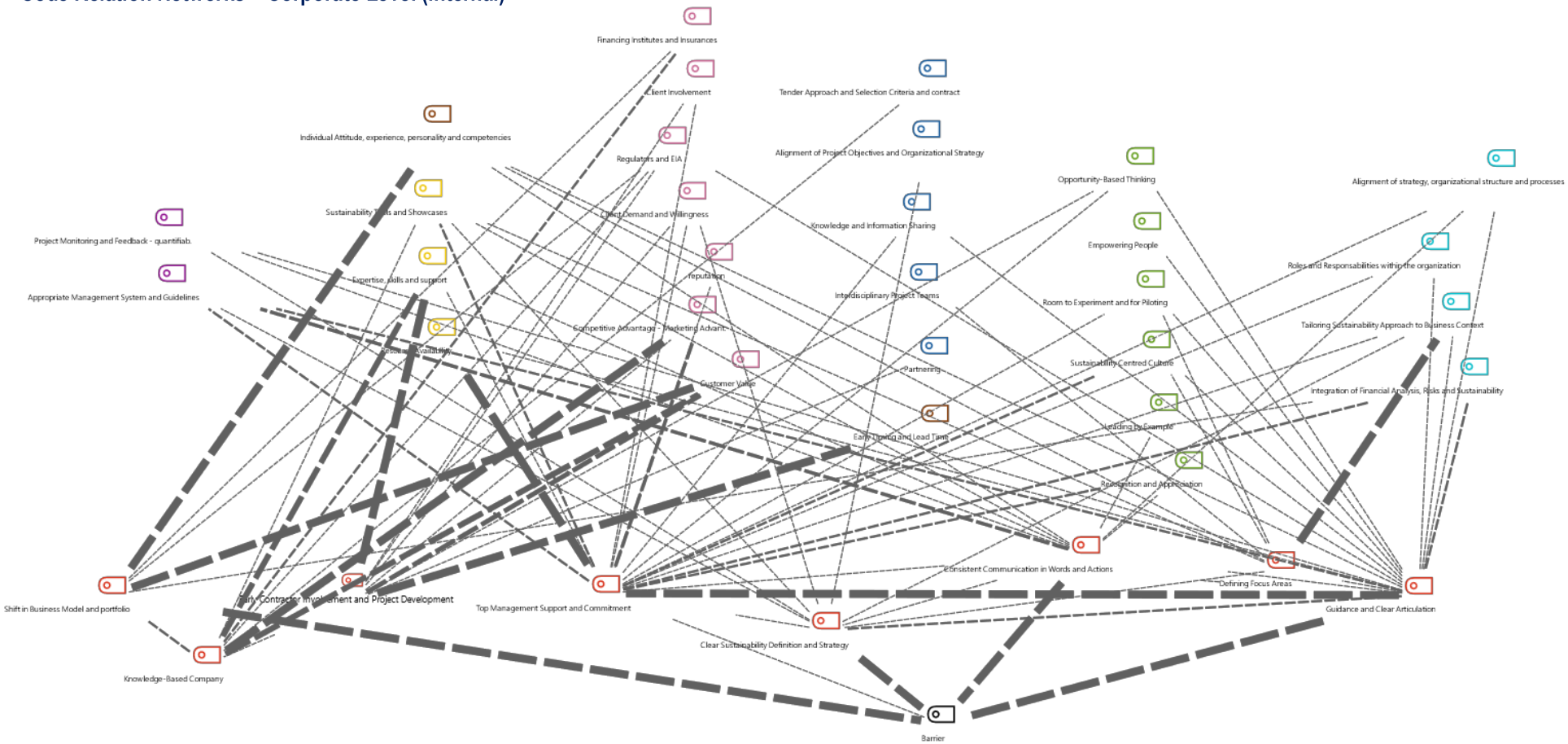

Figure 41: Code-Relations Network based on corporate leadership (illustration: MaxQDA)

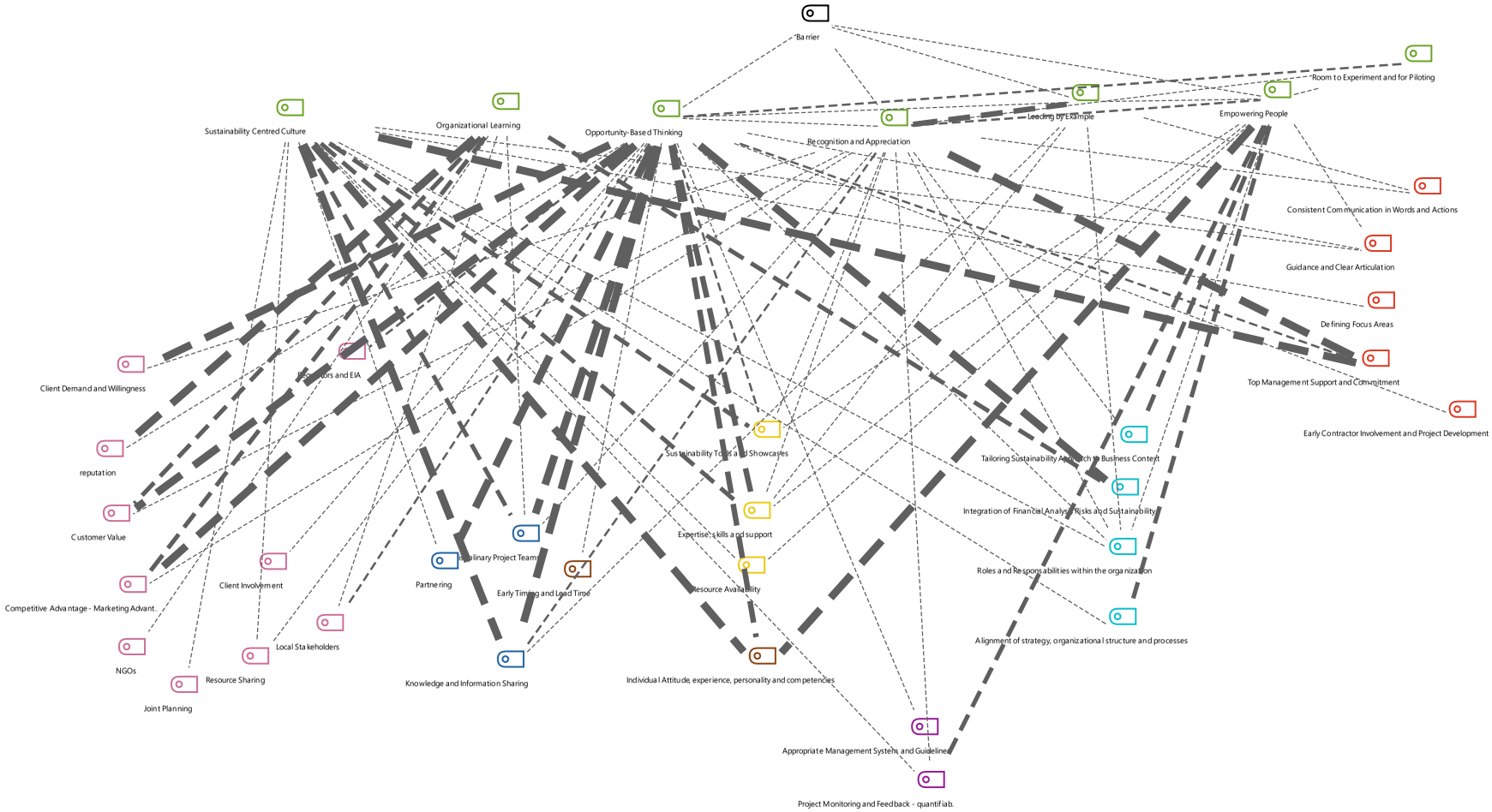

Figure 42: Code-Relations Network based on culture (illustration: MaxQDA)

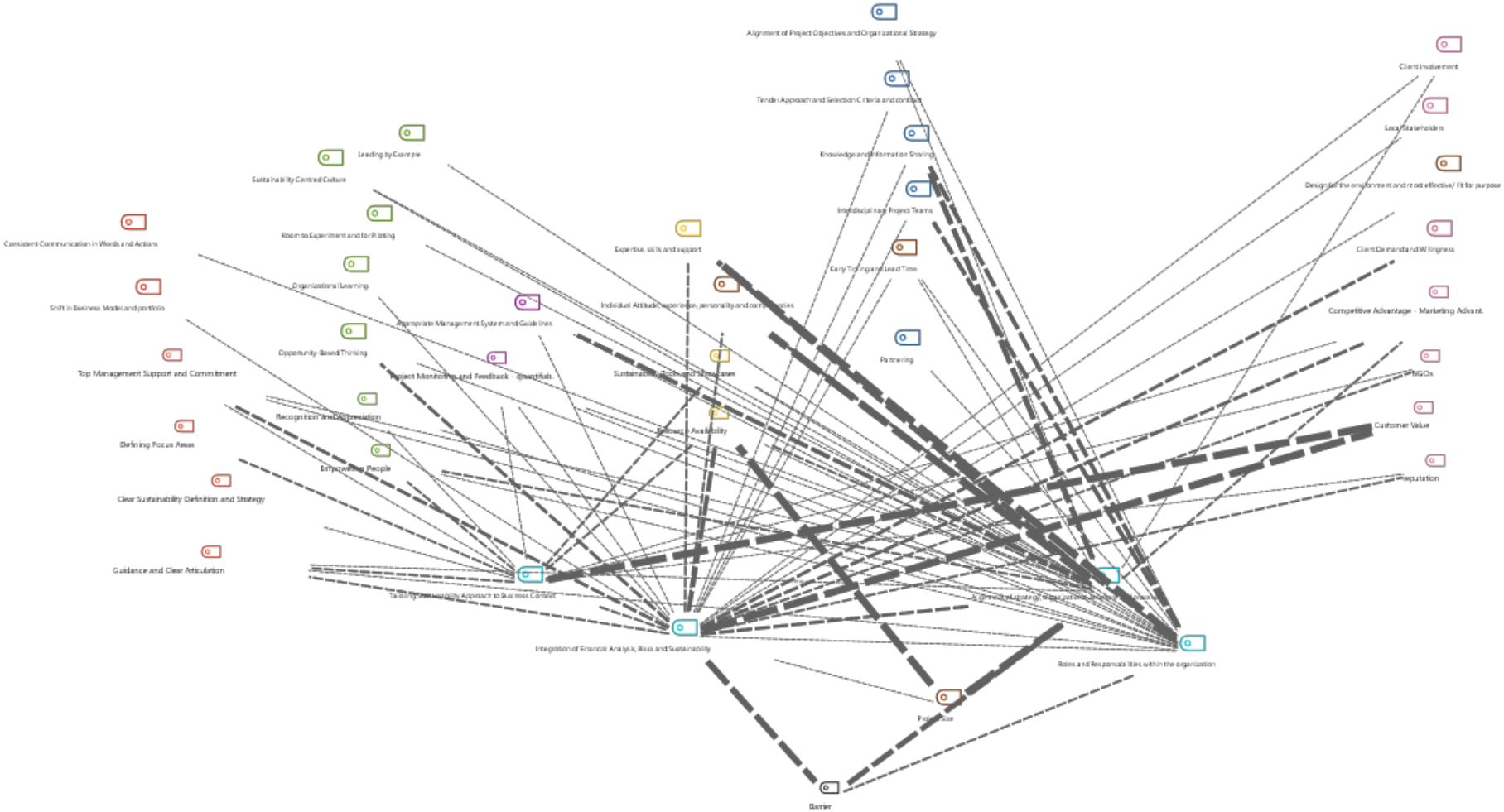

Figure 43: Code-Relations Network based on company structure (illustration: MaxQDA)

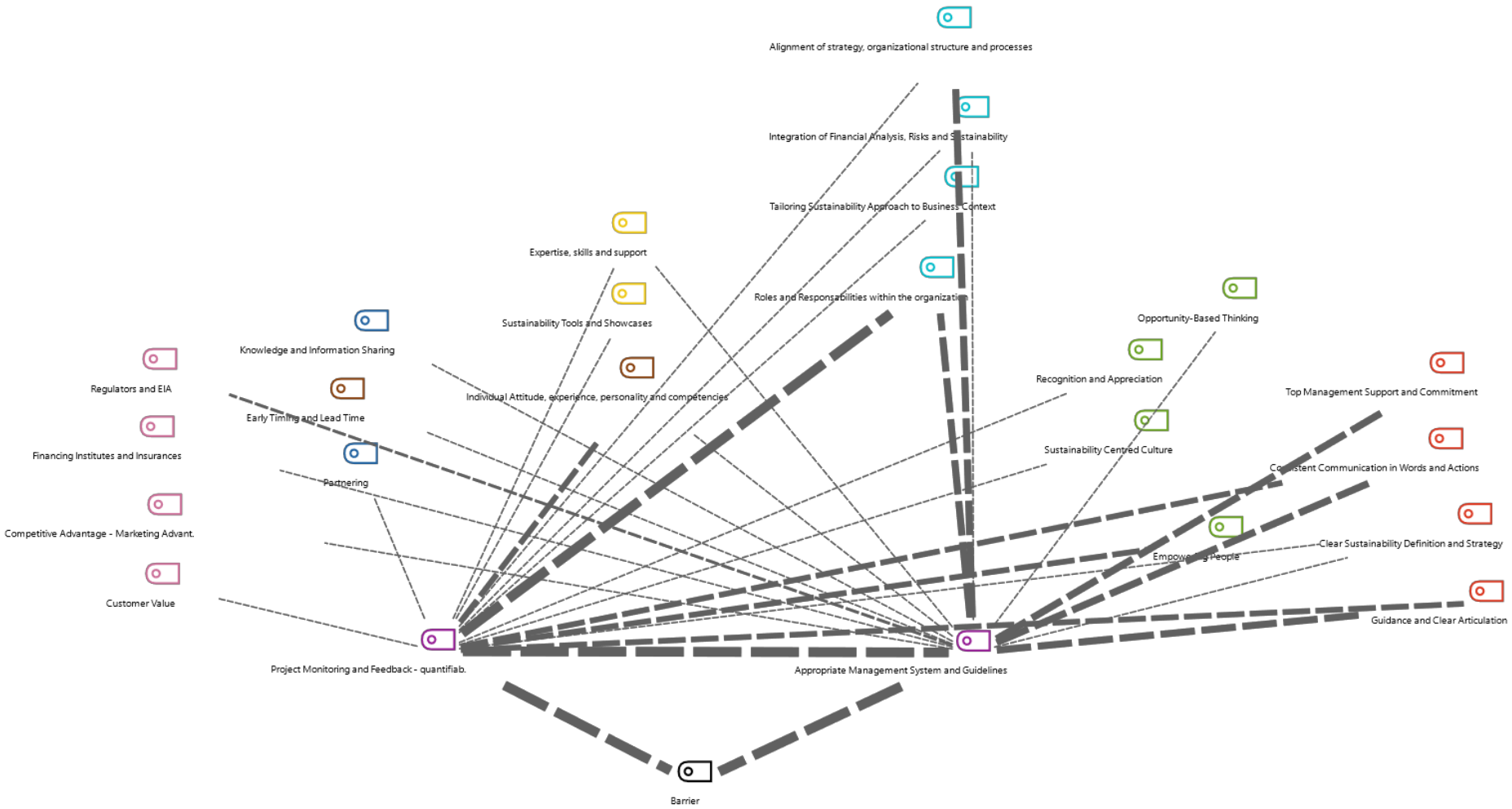

Figure 44: Code-Relations Network based on management control (illustration: MaxQDA)

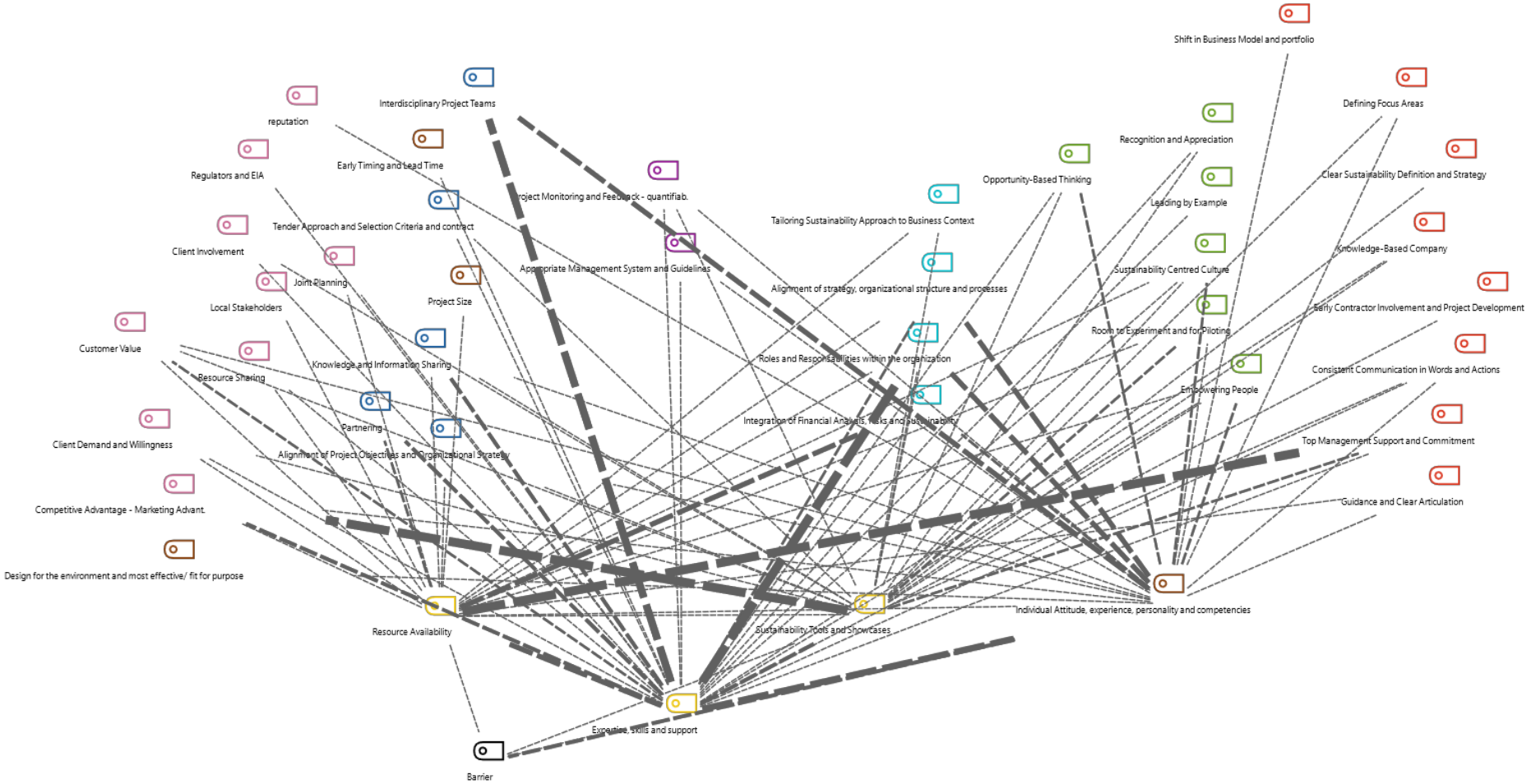

Figure 45: Code-Relations Network based on capabilities (illustration: MaxQDA)

Code Relation Networks – Project environment (interface)

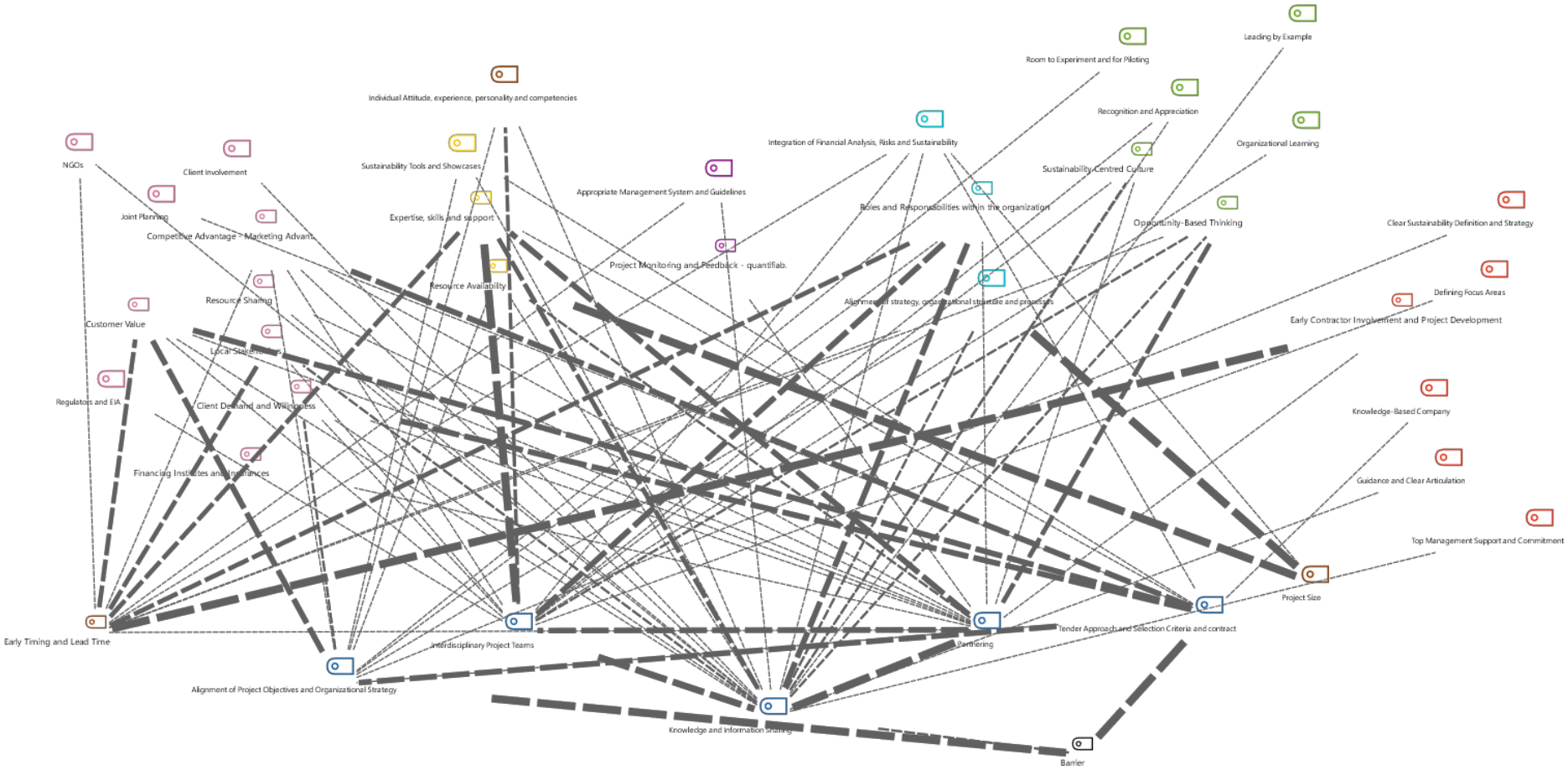

Figure 46: Code-Relations Network based on collaboration (illustration: MaxQDA)

Code Relation Networks – Socio-economic context (external)

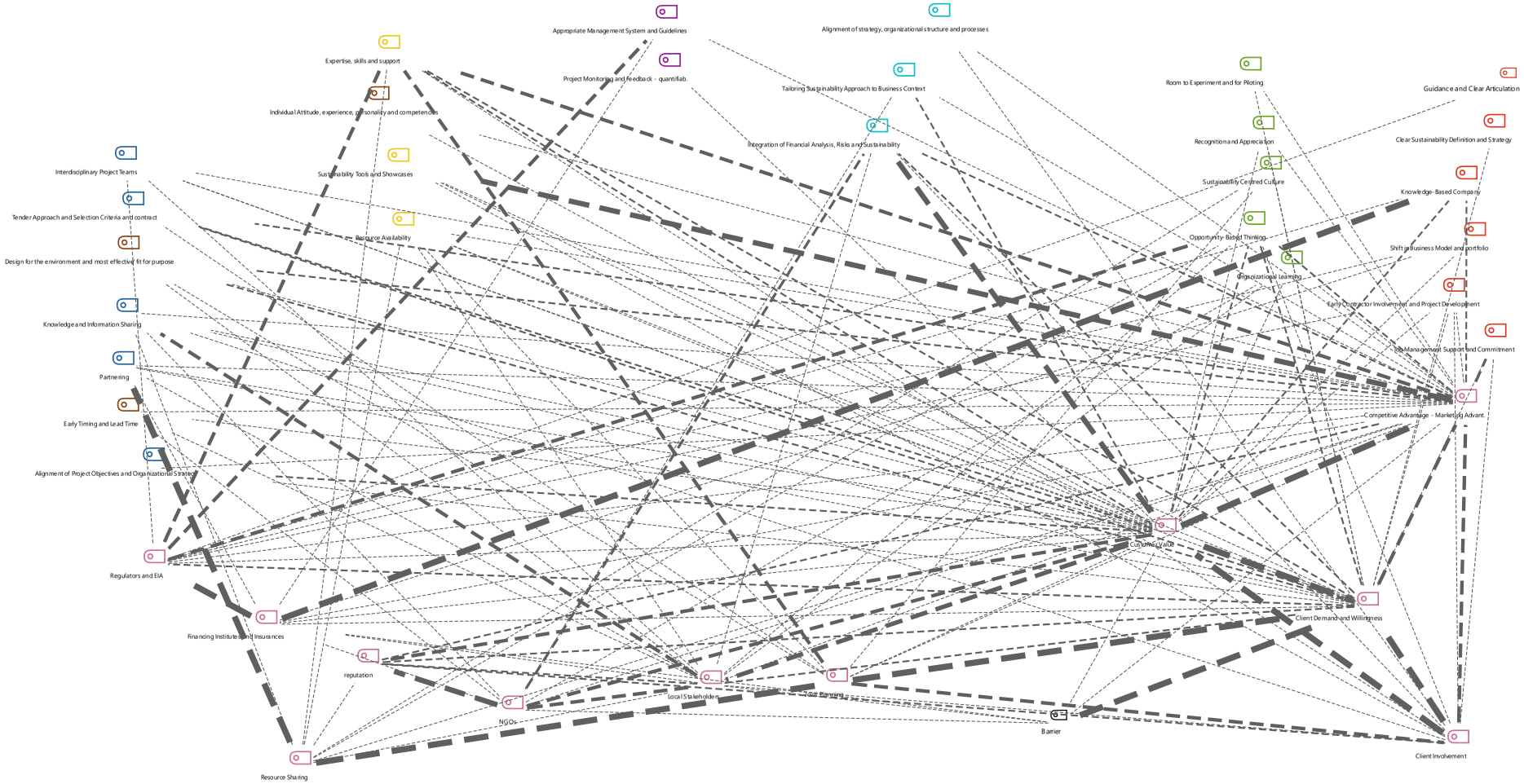

Figure 47: Code-Relations Network based on socio-economic context (illustration: MaxQDA)

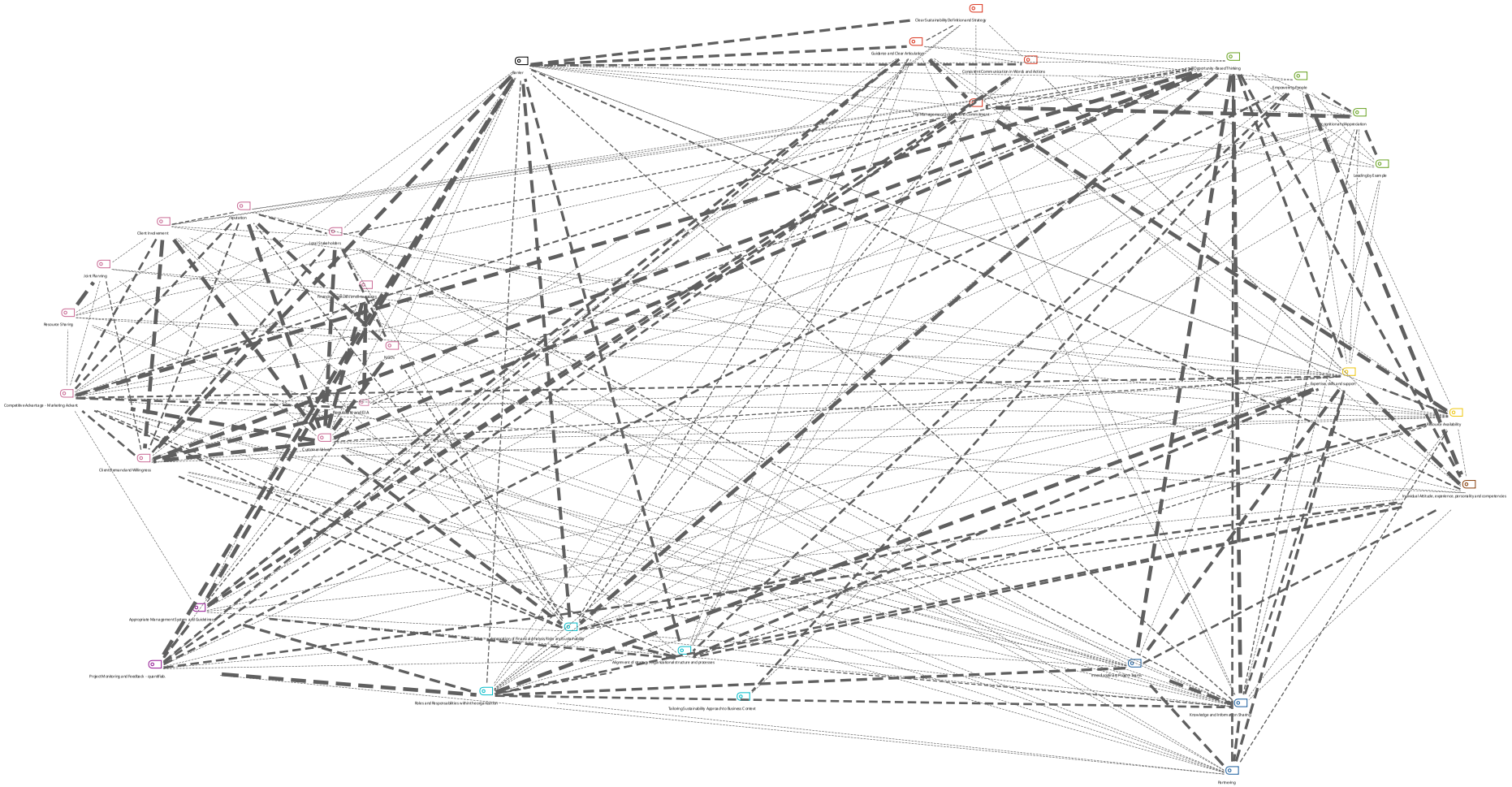

Figure 48: Code-Relations Network based on snowball principle: displaying most important relations starting from the context (illustration: MaxQDA)

c. Qualitative Case Study Results (excerpt)

[1] Corporate Leadership

Table 29: Summary of key take-aways from corporate leadership in the cases

Top management support and commitment	
MZ	● resources are made available i.e. to look into sustainability aspects such as environmental engineering and stakeholder engagement already early on (S1, O7, O9)
BAH	● respondents on project level, including the tender manager recognize clear commitment and support from the area manager, who pushed the coral engine initiative forward (T4, T5, O11) ● during cost cutting exercise, the budget for the coral engine was made available from the area to continue the study (S1, T5) ● S1 sees clear support, that as leader of a business unit, he may invest in sustainability and has the freedom to make his own decisions ● the support of the sustainability related research innovation, without clear way to profit facilitated implementation (O11)
NL	● the tender was a major goal for Van Oord, which is depicted in the resources made available as well as the highly competent people assigned to the project (T6, O13) i.e. an area manager took the role of the tender manager (T6), but also the remaining team were "surely not the left-overs" (O13)
Clear and unambiguous sustainability definition and strategy within the organization	
MZ	● sustainability can become a buzz word and is not something concrete, or easy to incorporate; further definition is needed to enable consistent integration (S1, T3, O7, O8)
BAH	● it depends on the definition, sustainability requires a more concrete definition to enable integration (T4, O10, O11)
NL	● to integrate sustainability, it really depends, how you define it (O13, O14) ● the themes are nicely defined, though the difference between the license to operate and the license to grow and specifically the focus on license to grow gives the impression, we are done with the license to operate and some parts of the company still need work in the license to operate part (O14)
Consistent communication in words and actions	
MZ	● the sustainability ambitions regarding stakeholder engagement have been addressed during the kick-off meeting with the client (O9), which has been followed by the go decision of the board to start working on that effectively on Van Oord's own initiative (O7, O9)
BAH	● it seems a bit more beautifully presented, than it is, though resources are made available as in engineering tools, time and some smaller budgets (S1, T4, T5)
NL	● During the tender phase, the tender manager provided clear instructions about the sustainability strategy of the tender, which was consistently incorporated into the design (T6) ● on corporate level, respondents perceive, that it is put on the agenda; however unless it is a client requirement, not addressed in tender review meetings (T6, O13, O14). This also relates to the trade-off regarding price (O12).
Guidance and clear articulation to what extent sustainability must be integrated	
MZ	● Focus areas were identified based on brainstorm sessions and there was strong commitment towards stakeholder involvement. The tender team had clear instruction to work on environmental and social aspects, going beyond the client's requirement, while not increasing the costs to remain competitive (S1, T3, O7, O8, O9) ● As a result, features proposed pro-actively in the bid, that were not asked for by the client, were not priced and resulted in a "menu-kaart", that is an alternative offer, highlighting the sustainability expertise (S1, T3, O7, O8, O9).
BAH	● In the tender – and project guidance materialized in a clear commitment towards testing sustainability tools in the project, including an own budget to further develop the reef guard program, including a clear budget and expectations towards the client to share local resources (S1, T3, T4, O10, O11). ● on corporate level, a lack of guidance is observed how to concretely deal with sustainability in the process and to what extent it should be included (O10, T5), though the SEA initiative provides implicit guidance (O11) ● the trade-off between costs and taking it on board remains unclear
NL	● The brief was not only to make a safe cost effective design, but also to add recreational and ecological value (T6, O12). ● The guidance was mainly based on the sustainability ambitious client, which in turn inclined internal support. The selection criteria predefined focus areas, which supported guidance ● on corporate level, sustainability is put on the agenda, if it is a client requirement (T6, O13, O14)
Shift in business model and portfolio management	
MZ	● if the end point is not sustainable, it becomes difficult; this should be addressed already upon acquisition and to step in earlier and leveraging such opportunities is task of the commercial people (O7, O8)

	● the idea is also to look beyond risk, and at the opportunities by engaging with stakeholders instead of focussing on requirements (O9)
BAH	●.. in other projects, the scope oftentimes merely execution, so little design responsibility, which makes it difficult to effectively contribute to sustainability (T5)
	●..in the strategy, there is already a tendency to get to a more knowledge driven company, which also implies getting involved earlier and follow the money of banks, which set their own standards, even in less developed countries (S2)
NL	●..it is really worthwhile considering targeted tendering, so that you can get the stakeholders on board early on; though choosing freely is not always possible especially under current market conditions, where we as a company need to sustain (O14)
	●..the future business is really creating also value for the nature and working with nature (T6)

[2] Corporate Culture

Table 30: Summary of key take-aways from corporate culture in the cases

Opportunity-based thinking	
MZ	● interdisciplinary workshop to identify opportunities for taking a more effective approach led to an optimized routing for construction, which significantly minimized coral reef crossing (S1, O8)
	● stakeholder management pro-actively maps the external context to focus not only on risks, but especially on opportunities for instance to partner up for sharing local knowledge to concduct marine habitat monitoring (O9)
	● given the scope of the project, financial institutes are highly involved including their sustainability requirements. To assist the unexperienced client, the tender team consulted the client regarding environmental and social aspects to be integrated, which improved the proposal, lowered the risks and therefore had a direct connection to costs (S1, O7)
BAH	● implementing the coral engine into the tender was driven by the tender manager seeing this opportunity coming and connecting the right people (i.e. the client and the area providing resources and the environmental department bringing the tool) (S2, T5, O11)
NL	● opportunities were identified based on brainstorm sessions, facilitated by a process manager (T6) and internal auditing by environmental experts, where opportunities arise to add value (T6, O12)
	● based on a strong focus on stakeholder engagement, opportunities to improve the tender proposal were sought i.e. the integration of a beach lagoon based on a local stakeholder session (T6, O13)
	● the project context bore the opportunity to apply the BwN concept, which also facilitated knowledge building regarding nature based solutions (T6, O12, O14)
Empowering People	
MZ	● no case specific insight, but O7 mentions the difficulty to oppose the view of the tender manager as he is the ultimate decision-maker in the team
	● O9 states, that on corporate level sustainability driven ambassadors should be enabled to roll-out the strategy by pro-actively assigning them into teams
BAH	● S2 had the freedom to provide budget, despite cost cutting exercises on corporate level; as a leader he assigns great value to empower those more capable for developing ideas (S2)
	● O11 describes the great support to pursue his innovation without clear path to profit
	● T4 describes the project culture during execution as open and empowering, so that ideas could come up from operational level (i.e. opening the mangroves up for water inflow to enhance their growth)
NL	● T6 was empowered to relatively freely decide, which actions to take and to experiment (T6, O14)
	● as a result, he assigned the ecologists and landscape architects the same mandate as the technical engineers, which led to a more valuable design in terms based on their ideas
Organizational learning sensitive to sustainability issues	
MZ	● consultation of the project office for lessons learned enabled taking the right direction (S1)
	● given multiple tenders on the market of the same region, cross-tender learning regarding environmental and social aspects has been mentioned as important to improve (T3, O7, O8)
	● impacts were especially carefully assessed given competitor's poor reputation, which was taken as a lesson learned (O8)
BAH	● tender learned from bad publicity of other projects in the area (T5, O10)
	● the stakeholder engagement planning was cross tender/ project learning and based on a strategy successfully applied in NL
	● the BwN design was based on a former, though being further developed and improved (O12)
NL	● the project in execution was carefully monitored to gather data for improvement and effectiveness of the BwN concept
Room for testing and pilot project	
MZ	● not greatly addressed, though considered necessary by O7 to develop and drive change
BAH	● characterized by room for testing and experimenting by providing budget for the reef guard program, even after first rounds of failure, testing was continued given its innovative character (S2, T5, O11)

NL	● research and laboratory tests were made, how to best integrate the different sand layers of the dune set up (O13) ● data collection for testing the effectiveness of the solution and subsequently adapt (O14)
Recognition and appreciation of sustainability engagement	
MZ	● proposal to improve the environmental – and social aspects of the proposal were highly appreciated in the team (O8, O9), this is considered an important incentive
BAH	●..the tender and project appreciated engagement by stimulating and welcoming sustainability related input across all levels (S2, T4, T5, O11)
NL	●..to foster a pro-active mindset regarding sustainability, T6 and O14 consider it important to appreciate certain behaviour and not to punish, if something out of the box went wrong

[2] Company Structure

Table 31: Summary of key take-aways from company structure in the cases

Creating accountabilities, roles and responsibilities for the organization	
MZ	● The MZ case featured two experts from the environmental department, which have been involved upon request of the tender manager, knowing the complexity regarding the physical and social environment of the project (S1, T3, O8, O9) ● participation is of environmental engineers is not standard, as it is up to the decision of the tender, or area manager, whether or not to involve such expertise (S1, O7, O9) ● on corporate level, respondents assign the environmental department of E&E the main responsibility for sustainability related topics (S1, T3, O8, O9) ● respondents cannot name an official department responsible for sustainability, but there are aspects of SMD, E&E and HSE coming together, which are not integrated (S1, T3, O9). This is reflected in the scattered set of different sustainability KPIs (S1), and mentioning various initiatives across the departments. As a result, information and initiatives are not well integrated and scattered in the company (S1, T3, O9, O10).
BAH	● In the project, there was a clear role division, including the head of environmental engineering, and two other engineers for the coral engine project and a dedicated stakeholder manager during execution (T4, O11) ● the environmental department is seen as pertaining the role – and knowledge regarding sustainability, while there is no clear allocation of roles and responsibilities on corporate level (T5, O10, O11)
NL	● the sustainability scope entailed a clear role – and responsibility distribution (T6, O12) ● external experts were included given resources scarcity to create the ecological – and landscape design (T6, O12) ● dedicated stakeholder managers were assigned for the tender – and execution phase (O13) ● for CO2 emissions, one of the focus areas in the project, a dedicated expert from HSE was involved and monitored compliance during execution (O13)
Alignment of corporate strategy, organizational structure and processes	
MZ	● on corporate level, sustainability is not effectuated in the processes (O7, O8, O9), though in the MZ case, the project office was consulted early to have appropriate guidance of the needed expertise and aspects to take into account (S1) ● triggering early on the discussion surrounding sustainability opportunities is vital for success (O7, O9)
BAH	● the processes do not account for sustainability in the tender phase (T4, T5, O10,), though its integration would symbolize importance ● the BAH case had a sufficiently big project to allocate some of the turn-over to pro-actively integrating sustainability, also once the area budget was no longer available ● the awareness of the reef guard program and the need to find an opportunity for its application was based on informal communication within the actors network (S2, T5, O11)
NL	● if sustainability was a corporate goal, it should be addressed in the official tender review meetings and integrated into the processes (T6) ● the stage gate process was followed, but the tender documents by the client and his requirements triggered the need to request environmental and social value adding expertise
Integration of financial analysis, risks and sustainability	
MZ	● for the environment, the environmental engineers put in their requirements, which has to be considered in the pricing and, which then becomes a balancing act (T4, O8) ● the tender evaluation meeting addressed price reduction and risks, whereby sustainability related risks were a large part (S1); this was key added value to the client as he was not knowledgeable in the field of offshore construction (S1, O7, O8); the integration of sustainability and risks had a direct net positive impact on costs for the client (risk management), but also indirectly given lowering interests rates upon lower risk profiles (S1)

	● the bid submission featured an optional bid, which had a higher standard than required by the client, which reflected the possible capabilities, but was not priced to remain competitive (S1, T3, O7, O8)
BAH	● it was a management decision to allocate budget for the coral engine project (S2, T5, O10, O11)
	● joint development with a client, and a contract featuring provisional sums enabled the integration of environmental and social scope into the contract at any stage (T4, T5)
	● the integration was eased by internal resource availability paired with a client, who was willing to pay for the initiatives (T4, T5)
	● respondents observe, the benefits of integrating risks, costs and sustainability (S2, T5, O10, O11); considering the environmental and social aspects of sustainability can de-risk projects (S2, T5) i.e. reputation has been a great risk for the client, thus providing the opportunity to the contractor to assist in preserving – and enhancing this by adding environmental and social scope resulting in positive publicity (T4, T5, O10)
	● also in developing countries, requirements are stringent as usually financiers are involved (S1, S2, T5); It is then added value for the client, if the contractor can support managing those risks
	● tools and expertise regarding risk management is housed in the risk department, which in turn is requested based on the tender manager's decision (T5)
	● In the NL case, it was a management decision to invest in sustainability, while not raising the costs too much (O12); This is because costing is an area management – and commercial decision (O13)
NL	● for the integration of the environmental and social aspects into the tender, the EMVI criteria provided guidance, how to deal with trade-offs and eased integration of all three topics (T6)
	● Risks relating to the environment stem from extensive EIAs (O14), which trigger tender managers to request support (T3, T5, T6, O14)
	● Risk is assessed by the engineers and subsequently discussed with the board (O12)
Tailoring sustainability approach to business context	
MZ	● no legal, or regulatory framework exists for the scope of the project, which is why the tender had to infer its own requirements framework (S1, O7, O8)
	● the sustainability approach taken took this uncertainties into account, but also the need to educate the client and thereby adding value (S1, O7)
	● which sustainability actions to act depend on client and location (T3, O7, O9)
	● a standard bis was offered based on the client's requirements including the fauna guard and adaptive management with optionally more services to choose from (T4); if the client profiles are similar and the scope of the project, similar topics pop up (O8)
BAH	● sustainability initiatives integrated such as the coral engine and close stakeholder interaction matched the context (S2, T4, T5, O8, O11)
	● to convince the client of integrating sustainability, reputation was leveraged as trigger (S2, T4, T5, O10)
	● the importance of the environmental dimension led the focus towards enhancing this value in particular (S2, T4, T5, O10); though it is not possible to blindly copy targets and solutions irrespective of the context (O11)
NL	● it depends on the client, the area and the opportunities to add value, which sustainability aspects are more stressed (T6, O12, O14)
	● BwN approaches need to be tailor made as it integrates into existing nature; especially to integrate habitat development (O12, O14)

[4] Management Control

Table 32: Summary of key take-aways from management control in the cases

Project monitoring and feedback methodology to assess sustainability performance	
MZ	● performance indicators mainly relate to local content provided by the client's requirements (S1)
	● a brainstorming session, including non-tender team members was scheduled to receive feedback (S1)
BAH	● during execution, the BAH case measured environmental performance, for instance the survival rate of coral relocation (T4)
	● the BAH case had especially in execution a very integrated team and open discussions leading to environmental scope enhancements (T4)
NL	● a environmental expert assessed CO2 performance and ensured compliance to promised targets (O13)
	● feedback was requested internally (other departments auditing the design), but also externally for instance by letting review the tender documents and the environmental design (T6, O12)
Appropriate management system and guidelines and **individualized performance targets and reward systems**	

MZ, BAH, NL	● development areas as explained in text
Specificity and quantifiability of sustainability for practice	
MZ	● there has to be a clear, quantifiable pay-off, what the outcome is, so that it matter to people; sustainability is intangible and there lacks clear pay-off regarding risks (S1) ● if we intend to be pro-active, we need to be able to specify our emissions and bring it forward to the client (T3)
BAH	● on the Bahamas, there was no quantifiable pay-off; in this case, sustainability added cost, but it is hard to say, what the added value is in terms of enhanced reputation; besides, there is more than just costs being meaningful ● It is important to make it more concrete, so it becomes more tangible and easier to incorporate (O11)
NL	● own calculations were made based on the score criteria, which helps to determine, what is needed to win (T6, O12) ● presently, it is being developed, how to quantify ecological value, but that will have little meaning to the client, if he does not see the need to add that value in the first place; such methods are needed, once decision-makers are convinced to be willing of adding sustainability and need to quantify it for their own planning (O14)

[5] Capabilities

Table 33: Summary of key take-aways from capabilities in the cases

Resource availability	
MZ	● the environmental department was early involved and requested (S1, O7, O9) ● given competing tenders in the area, prioritizing those projects with more demanding clients took place, so that the involvement of O7 was limited ● also due to the project size, resources could be made available for sustainability engagement such as social investment and anticipated stakeholder engagement (O8, O9)
BAH	● dedicated personnel for stakeholder engagement and environmental impact as well as the coral engine were available (S2, T5, O10, O11) ● budget from the area provided room to experiment, which was also perceived as clear signal of commitment (T4, T5, O11) ● upon close client collaboration additional resources could be made available to support Van Oord's ambitions regarding the coral relocation – and rehabilitation (S2, T5, O11)
NL	● the NL case was a major target for Van Oord, so that resources were made available (T6, O13) ● the tender manager received from top management all the support he wanted, including hiring external expertise, a dedicated project office and internal expertise entailing even a process manager (T6, O12) ● already in the tender phase, the client provided budget to carry out extensive soil investigations (T6, NL_A), which in turn improved the design and led to a 15% sand reduction. This is not only cost saving, but also resource efficient (both in turn of sand mining and emission during construction)
Sustainability tools and showcases	
MZ	● a standard offer including the fauna guard and adaptive management as well as optional features to be added (T4) ● considered essential during the tender phase as they are off the shelf for the commercial actors, which gives them on the one hand confidence to share and advertise certain initiatives, but also can be easily added under time pressure (S1, T3, O7) ● to persuade the client to take a more stringent sustainability approach, showcase projects were presented to trigger discussion (S1, T4) ● tools, in which Van Oord has a unique selling point are further more marketing advantage and to be used as differentiator (S1, T4)
BAH	● pro-actively proposed the coral engine initiative by adding promotion material to the tender proposal and approaching the client (S2, T5) ● the existence of the reef guard program and the intention to seek further application was actually the trigger to approach the client (S2, T5, O11)

NL	● no concrete tools were added, but instead the building with nature concept, which is internally developed in a partnership with other actors of the industry could be showcased and subsequently became central to the design (T6, O12, O14)
Competencies	
MZ	*Individual attitudes, experiences and personalities* ● respondents signal an intrinsic interest to sustainably create infrastructure, beyond the requirements of the client, if needed (O7, O8, O9); but also because it can help to differentiate and assists the client (S1, T4) *Skills and expertise* ● environmental engineers provided support regarding environmental and social aspects in a pro-active manner (S1, T3, O7, O8, O9) *Knowledge and awareness* ● was created by consulting the project office early, and getting the right expertise on board upon knowing the entailed environmental complexity; though this relates to the tender managers perception
BAH	*Individual attitudes, experiences and personalities* ● all respondents indicate great intrinsic motivation within the tender – and project team towards sustainability; this is reflected especially in the leadership during tendering and the project, where sustainability is assigned top priority (S2, T4, T5) *Skills and expertise* ● was supported by the environmental department, including environmental engineers, ecologists and a stakeholder manager (T4, T5, O10, O11) ● highlights importance to consult such experience to optimize the design proposal to see, where it is possible to add value (O10); also for risk distribution and assessment, the appropriate expertise is required to achieve better results (T5) *Knowledge and awareness* ● based on company network, awareness of ongoing reef guard program, which then found the opportunity for application (S2, T5, O11); subsequently, the necessary expertise was brought on board, having the needed knowledge
NL	*Individual attitudes, experiences and personalities* ● the tender manager was very much aware of the need to integrate a safe, feasible design with the needed ecological and social values (T6), therefore, he composed his team accordingly; besides, he also see the future in creating marine infrastructure with nature instead of merely destructive (T6) *Skills and expertise* ● various expertise supported the tender team next to the core expertise required such as process manager to facilitate brainstorming sessions, landscape architects to add recreational value, an environmental consultants, but also from HSE and E&E for emission aspects and environmental design respectively (T6, O12, O13, O14) *Knowledge and awareness* ● was present at start, and further triggered by client's requirements; the expertise was then onboarded

[6] Collaboration

Table 34: Summary of key take-aways from collaboration in the cases

	Clearly defined project goals and sustainability policy
MZ	● The case itself featured a clear and unambiguous sustainability strategy in the tender in so far as the environmental expertise paired with technical know-how was highlighted to please the client (S1, T3, O7, O8) and the focus was on the environment given the absence of a legislative framework (S1, O7)
BAH	● the focus of the sustainability strategy was to engage with stakeholders and share knowledge to enhance reputation, as well as minimizing impact (i.e. coral relocation) and adding value to the environment by employing the coral engine, to reproduce coral, that is destroyed during construction ● strategy was triggered by the project's development, in which the tender manager perceived the opportunity to connect the VO internal project to the matching context (S1, T4) ● the testing of the innovative solution was also a Van Oord internal goal with associated budget (S1, T4, T5, O10), which supported a clear strategy and focus areas
NL	● winning strategy based on the integration of creating a cost-effective, safe as well as ecological and social design (T6) ● to a large extent steered by the client's requirements, which facilitated such orientation. The assessment criteria, following the tender approach provided a clear indication to the tender manager, what

	sustainability aspects to focus on and how the different aspects would be assessed (T6, O12). This was communicated further down to the tender team.
	Alignment of project objectives and corporate strategy
MZ	● client made clear, environmental aspects would be "Tick-in-the-box" items (S1, T3, O7) with a clear focus on technical feasibility and price ● a large extent of the stakeholder engagement lays with the client, as contractors are forbidden to interact with parties outside their direct project environment (S1, O7, O9) ● case shows, it becomes really difficult to integrate sustainability, if the client is not willing; environmental requirements, which are inappropriate were addressed by the tender team, but kept unquestioned as the client insisted on the (wrong) requirements (O7)
BAH	● initial objective was to expand the harbor to facilitate its vessels, but acknowledge the added social and environmental value, that have been put forward by VO
NL	● sustainability demanding client, who rewarded environmental and social aspects in the tender. In such case less conflict potential is likely to occur.
	Tender approach and selection criteria aligned with sustainability objectives
MZ	● the MZ case clearly distinguished, as it was strongly commercially driven and based on price and a robust, technical design (S1, O7) ● an optional offer, which went beyond the client's requirements was only way to reflect the possibilities of enhancing environmental value whilst remaining competitive (S1, T3, O7, O8) ● case showed, that contractors struggle to remain competitive, while delivering higher quality to the social and physical environment ● client chose some of the proposed solutions, though limited, reflecting the power in decision-making
BAH	● unit rate, though provisional sums allowed during execution; changes also late were still possible and accepted by the client, if needed (T4, T5)
NL	● aligned the strongest, as the selection criteria rewarded the creation of social and ecological value, which in that sense enforced the tender team to take this into account (T6, O12, O13)
	Effective Approach
MZ	● strong environmental drive to optimize the design and lowering the impact on seagrass, corals, marine mammals, though remaining cost effective (S1) resulting in an alternative route, that significantly lowered environmental impact and improved the design (S1, O8 ● strong focus on the "what and why" also of legislative frameworks and targets from the EI(S)A, though the client was difficult to convince and insisted on requirements, which are less appropriate (O7, O9)
BAH	● already due to the nature of joint planning and collaboratively developing the project; ● strong drive to optimize waste and to try to be as efficient as possible (T5); environmental enhancement could be obtained by reclaiming land instead of dumping it offshore (O10)
NL	● the harbour entrance was designed to provide natural habitat for fishes (T4) ● it was essential to sense the client's underlying interest, as during dialogues the tender manager sensed, the client has already concrete ideas about the solution (T6) ● questioning the technicians viewpoints constantly and encouraged them to take into account the client's drivers next to a safe design (T6) ● requirements provided by the client regarding natural habitat development were inappropriate for the local environment, which was openly addressed in a clarification meeting (O12). While that would have been possible, it would have resulted in a significant waste of resources. As a result, an optimized solution could be found, which altered the client's requirements (O12). ● the design was optimized towards minimum maintenance efforts (T6, O13)
	Early Involvement and consideration of Sustainability
MZ	● early on mapping the socio-economic environment enables the establishment of partnerships locally to access valuable knowledge (O9) ● early on workshops took place, leading to early adaptation of strategies to be used during execution (S1) ● exceptionally long tender process of 5 years enabled multiple iterations and changes to the tender (S1, O7, O8, O9) ● helped to get a grasp of the stakeholder landscape (O9); this provided room to educate the client about environmental risks and making him understand the added value of sustainability (S1, O9) ● for aligning the budgeting with sustainability early consideration is needed to anticipate costs evolving during execution, as anything that is not estimated prior is difficult to change once a tender is a fixed

	budget (O8); conversely, the later the stage, the more difficult it gets to change path, because the client may not want to, although being better (O8)
BAH	● Van Oord was involved from the very beginning and developed to tender – and subsequently project together with the client (S2, T5, O10, O11)
	● the contractors expertise could be leveraged and implemented into the design, while providing opportunities for environmental enhancement and optimization of working methods and equipment in favour of the environment (S2, T5, O11)
	● Van Oord pro-actively persuaded the client to take coral relocation, but also the reef guard program on board (S2)
	● given the iterative design process, it is difficult to change things, which have not been incorporated into the contract (O10); during preparation, project should put sustainability on their agenda regardless, whether it is part of the project plan (S2)
	● T4 mentions the benefits of him being involved already prior contract signing, as this provided him the opportunity to grasp client expectations, and to better plan ahead execution
NL	● in the Dutch market it is known, which works will be put on the market based on multiannual plans (O14); it was also clear; the NL case would be coming to market soon (T6, O14); thus, early on strategically thinking who to partner up with is vital (O14)
	● the tender itself provided lead time for planning of a year, which enabled to come up with an optimized planning (T6)
	● early on focus was put on external stakeholders to grasp their expectations and fears to incorporate those into the design (T6, O13);
	● the early involvement combined with close engagement led to improvements and clarifications of requirements (O12).
	Interdisciplinary Teams
MZ	● close interaction between various the engineering disciplines, environmental department and cost estimation led to an optimized estimate under consideration of risks
	● due to the JV, partners bring in expertise for the remaining scope
BAH	● an integrated team containing ecologists, stakeholder managers and engineers; external disciplines were present during execution to facilitate local knowledge i.e. a diving company
NL	● the tender manager composed the team based on his experience, knowing the selection criteria would assess not only the technical sound design, but also ecological and recreational value
	● early on key parties were identified to be integrated to the team such as engineering firms and landscape architects
	● O12 mentions the difficulties, arising when working with other disciplines as they have different ways of thinking; while T6 explains, he had to actively convince especially the technical engineers of the added value of a diverse team
	● much of the design scoring on recreational and environmental value has been triggered by ideas from other than engineering disciplines
	Client involvement and joint planning
MZ	● whilst now being partner in the joint venture, VO was initially sub-contractor until, given its environmental and technical expertise, they could bring themselves in as JV partners to de-risk the contract
	● to identify the client's value, the MZ case collaboratively developed the project over a comparably long timeframe of 5 years until contract award, including multiple iterations, while it was necessary to educate the client
	● frequent workshops were used to advertise especially environmental related capabilities, of which some where taken on board upon discussion
	● early on a strong focus on transparency was put by sharing sensitive information to build trust
BAH	● the BAH case developed the project from the preliminary design during tendering till the end of handover together (T5); based on a site visit, the first objectives were set and from that, the proposal was developed
	● the client needed to be convinced about the need of a comparatively large environmental – and social scope in terms of environmental impact mitigation, the coral engine and stakeholder engagement (S2, T5)
	● involving the client into the coral engine project allowed for shared resources, which eased the implementation; external, local stakeholders such as a diving companies were involved to share knowledge (S2, T4, T5, O11)
NL	● close client interaction based as competitive dialogue, including multiple rounds during the tender phase in which clarification meetings took place (T6, O12)
	● some of the requirements were not applicable as the client imagined, but also bringing forward the building with nature solution involved a change in requirements (T6, O12)
	● developing a sense, how the ideas land with the client, and what he actually wants during dialogue (T6)

	Identifying customer value
MZ	● de-risking the project by educating the client regarding environmental risks as well as minimizing reputational damage were clear customer values, which enabled to pro-actively trigger the client's interest in additional environmental scope
BAH	● the BAH case identified reputation as a key driver of the client, which combined with a politically driven context led to the enhancement of environmental and social scope ● the client was initially neither demanding the reef guard program, nor convinced, selling the added value of reputation served its purpose
NL	● the sandy solution was proposed based on sensing the client's intent to vouch for a soft solution ● knowing the strong emphasize on stakeholders enabled a tender proposal tailored to their expectations, which was welcomed by the client. It was even mentioned, that informing stakeholders about the tender or project's scope can make them bringing forward their expectations to the client, which in turn has an impact on the client's requirements (O9, O13)
	Knowledge and information sharing
MZ	● close collaboration between risk allocation, cost estimation and environmental aspects, which facilitated an optimized proposal (S1, O8) ● to identify and prioritize opportunities a brainstorm session took place with participants of different expertise to bring the knowledge together (S1)
BAH	● knowledge and information sharing was facilitated by close interaction during the tender phase, and an integrated project team during execution; even into client meetings super intendents were brought (T4, T5)
NL	● information and knowledge sharing was stimulated by having an own project office, in which the team members were required to work for at least 2-3 days per week and during weekly meetings, so that silos are omitted (T6)

[7] Socio-Economic Context

Table 35: Summary of key take-aways from socio-economic context in the cases

	Enforcing policies and principles
MZ	● difficulties faced as not established laws, or regulatory framework paired with an EIA, that is still under revision
BAH	● adherence to EIA, but also to the demands from credit insurances regarding sustainability requirements
NL	● not much addressed, other than natura 2000, which had a complicating impact
	Competitive positioning and marketing advantage
MZ	● difficulty regarding the ambitions of pro-actively integrating sustainability were the clients instructions, that sustainability related criteria would be low ranking points to differentiate ● VO was chosen for integrating environmental and technical expertise, so that the client had the certainty, he would have a knowledgeable contractor in case needed (S1, O7). Also the optional bid (not priced) showcased the capabilities beyond the client's requirements to send a message regarding the potential capabilities (S1, T3, O7, O8) ● you lose compared to competitors, if you increase the price due to unrequired aspects (S1, T3, O7, O8) ● the client's line of thought is whether sustainability is adding enough value compared to the cost (T4)
BAH	● the whole budget made available for the reef guard program built on the intention of the area director to seek opportunities to differentiate (O11) ● the reef guard program gave a presentation to the client early on to promote Van Oord, besides the area manager used it as "carrot on a stick" (S2, O11)
NL	● the NL case required environmental and social added value, but nevertheless, those capabilities enabled differentiation. For instance the lagoon as integrated part of the coastal defence structure and the proven building with nature approach were perceived as unique selling values.
	Client demands
MZ	● a lack of the client's willingness to pay mitigative (S1, T4) ● the client decides, what he wants and as a contractor you have to obey ● though client rather commercially driven client, it was possible to alter the clients demands and add environmental scope by educating the client regarding environmental risks, compliance and reputation (S1) i.e. some of the mitigative sustainability tools got accepted, but also the routing completely altered (S1, O7)
BAH	● tenders remain cost driven, so there is a strong focus to deliver, what the client asks for (O10) ● requirements were developed together (T5), which avoided a mismatch

	● the client could be convinced of the added value of investing in certain environmental actions to maintain his reputation (S2, T5) ● even during execution the negotiation part was left open, so changes could be made at late stages, by reasoning with the client (T4).
NL	● client demanded high performance not only on the economic, but also social and environmental aspects of the project ● the client adjusted his demands based on VO insight regarding the habitat development (O12)
Engaging with stakeholder	
MZ	● the MZ case could not engage with external stakeholders directly until contract sign due to contractual restrictions, however, this starts now in preparation
BAH	● stakeholder engagement initiatives such as a site visit and consulting NGOs (O10) ● NGO's concerns were mentioned to be important to address and enabled enlarging the environmental scope in a pro-active manner (T5, O10) ● Use of local knowledge to ease implementation of environmentally related aspects such as the coral relocation
NL	● local stakeholder meetings to get to know their concerns to subsequently integrate them into the proposal and achieve higher acceptance local stakeholders could bring forward ideas for creating recreational value

V. Research Validation – Expert Panel

a. Conceptual C7 Implementation Approach (Input for Expert Panel Validation)

This approach was presented during the focus group for validation. The main body of the text (chapter 6, discussions) presents the final outcome, its synthesis and related input from validation. Compared to figure 49 below, only minor changes have been made, resulting in horizontal (cross-context) integration of capabilities, collaboration and context.

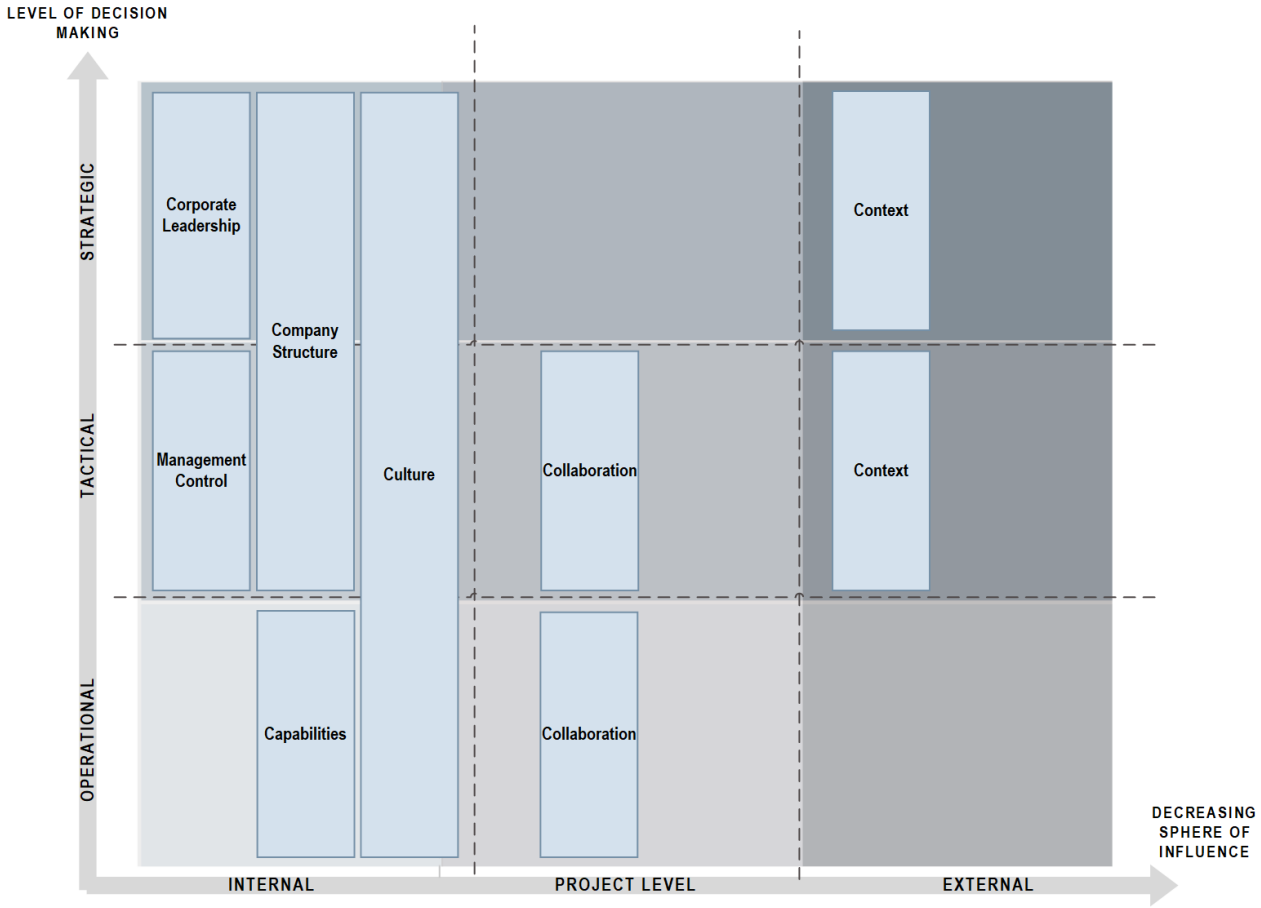

Figure 49: Initial C7 implementation approach for pro-actively integrating sustainability [own illustration]

b. Validation Exercise – Success Factor Questionnaire

Table 36 below presents the results from the success factor validation exercise, that has been taken place during the focus group for validation.

Table 36: Results Validation Exercise - Success Factor Questionnaire

After having filled in the questionnaire, please head to:
www.wooclap.com/BKCTPG

Background Information
Department, BU: _____
Role/ Job Title: _____
Working Experience: _____(VO) _____(total)

Please, indicate, whether the success factors are important for sustainability integration, and if so to what extent they are apparent within the organization. (see legend)

	Legend
1a	*"**yes,** important to success **and present** in the company"*
1b	*"**yes,** important to success and **present in some tenders**, requires further development"*
1c	*"**yes,** important to success, **but not present; great development potential** for the organization"*
2	*"**no, not important** for success"*

	Corporate Level - Internal					
1	**Corporate Leadership**	**1a**	**1b**	**1c**	**2**	**SUM**
1.1	top-management commitment and support for sustainability as central element	1	5			6
1.2	clear and unambiguous sustainability definition - and strategy within the organization		5	1		6
1.3	consistent communication in words and actions	1	4	1		6
1.4	guidance and clear articulation to what extent sustainability must be integrated		2	4		6
1.5	shift in business model / project portfolio management		3		3	6
2	**Culture**	**1a**	**1b**	**1c**	**2**	
2.1	developing sustainability centred culture		4	1		5
2.1.1	organizational learning sensitive to sustainability issues		3	3		6
2.1.2	room to experiment / for pilot projects	3	3			6
2.1.3	recognition and appreciation of sustainability engagement	2	4			6
2.1.4	opportunity-based thinking	2	2	2		6
2.1.5	empowering people	2	1	3		6
3	**Company Structure**	**1a**	**1b**	**1c**	**2**	
3.1	creating accountabilities, responsibilities and roles for the organization		2	4		6
3.2	alignment of corporate strategy, organizational structure - and processes		1	5		6
3.3	integration of financial analysis, risks and sustainability		2	3	1	6
3.4	tailoring sustainability approach to business context (geographically, sector, level of impact)		4	1	1	6
4	**Management control**	**1a**	**1b**	**1c**	**2**	
4.1	project monitoring and feedback methodology to assess sustainability performance		2	3	1	6
4.2	appropriate management systems and guidelines	1	3	2		6
4.3	individualized performance targets and reward systems		1	3	2	6
4.4	specificity and quantifiability of sustainability for practice		1	4	1	6
5	**Capabilities**	**1a**	**1b**	**1c**	**2**	
5.1	resource availability	1	5			6
5.2	concrete sustainability solutions, tools and showcases		6			6
5.3	competencies					
5.3.1	*individual attitudes, experiences, and personality*	2	2	2		6
5.3.2	*expertise, skills and support*	1	3	2		6
5.3.3	*knowledge and awareness of sustainability , training*					0
	Project Environment					

6	Collaboration	1a	1b	1c	2	
6.1	Clearly defined project goals and sustainability policy		4	2		6
6.2	alignment of project objectives and organizational strategy		2	4		6
6.3	tender approach and selection criteria aligned with sustainability objectives	1	3	2		6
6.4	effective approach / fit for purpose		3	3		6
6.5	early contractor involvement/ consideration in early project phases		5	*1*	*1*	7
6.6	interdisciplinary teams and partnering	1	3	2		6
6.7	client involvement and joint planning		4	*2*	*1*	7
6.8	identifying customer value		5	1		6
6.9	knowledge and information sharing		5	1		6
	External					
7	**Socio-Economic Context**	**1a**	**1b**	**1c**	**2**	
7.1	Enforcing policies and principles		5	1		6
7.2	competitive positioning and marketing advantage		4	2		6
7.3	client demands		6			6
7.4	engaging with external stakeholders		5	1		6

Feedback, notes and concluding remarks

- corporate leadership: consistency is the main issue; some tenders do not receive corporate leadership
- corporate culture: also consistency, not everybody wants it
- integration of financial analysis, risks and sustainability/ tailoring approach can become more important upon maturing
- capabilities: sufficient capabilities present for current demand, but not if all tenders and projects would require assistance
- collaboration: early consideration and client involvement only needed, if the client does not procure correctly
- context: highly dependent on geographical area, finance institutes involved, risks etc.
- client only open to changes if it lowers costs, or no penalties involved
- CSF model: horizontal integration?

NB. *The responses indicating 7, crossed 2 answers and left a comment accordingly.*

c. Results and Conclusions – Real-Time Poll Session

Table 37: Research validation statements for interactive discussion

	Corporate Level - Internal	Agree	Disagree	NA	Remarks
1	**Corporate Leadership**	++	-		
1	As long as leaders in the organization are enthusiastic, but do not make room for sustainability in their internal requirements, it lacks clear expression of commitment	5	1		#even more, if pay-off is not so clear, and there is not direct impact/ effect on eye sight
2	A clear and unambiguous sustainability strategy, indicating the implications on daily operations, is required to guide tenders for pro-actively integrating sustainability, especially, if clients do not specifically ask for sustainability enhancements	5	1		# a balanced strategy is needed, that is sufficiently open to not take away room for creativity # strategy not required but helps (wording)
3	Guidance is needed especially in case of trade-offs between sustainability dimensions (i.e. economic vs. environmental) to express the extent to which tender – and project level is expected to go beyond the client's requirements	4	2		# guidance is needed, but in verbal form not in terms of an unflexible policy document # corporate leadership should address trade-offs to indicate, how upper levels deal with that (i.e. in SG meeting 2b/c # contradicting: trade offs are complicated to assess, because sustainability is such a broad topic # so far, oftentimes sustainability integrated as a tool to win a tender # what is needed, a shift in project portfolio, or trying to make any project better, or both (central discussion)
2	**Culture**	Agree	Disagree	NA	Remarks
		++	-		
4	To pro-actively integrate sustainability, opportunity-based thinking is key as it broadens the mindset beyond requirements and entails a thorough understanding of the client, his drivers and the context	5	1		# discussion about "key", or not, because one respondent considers client key # though rest agrees, every tender has opportunities, it is about finding - and using them #Dutch market, opportunities less of a topic, because client are requireing sustainability anyway # discussion: integrating opportunities in, what VO rceives as tender documents, or already actively pursuing opportunities, by approach clients pro-actively to develop projects together # the more angles are added to a problem, the better the outcome and sustainability can provide such an added angle # topic re-occured throughout discussing other topics, is really central
3	**corporate structure**	Agree	Disagree	NA	Remarks
		++	-		
5	Decentralized decision-making gives great autonomy to tenders. The tender manager is the central decision-maker regarding the capabilities needed, the extent to which risks, financing and sustainability are integrated, the approach to the client and the establishment of an appropriate culture on operational level for the assigned tender	3	3		# 3 respondents: in tender phase, tender managers pertain less freedom, highly depend on the go of the area managers, from which resources and capabilities must be requested; thus actors above the tender manager have a large saying in approving or disapproving the tender approach # other voices mention, there is freedom to integrate sustainability # upon clarification, all agree, that it depends on the individual actor, because there is not corporate guideline, when to consult which expertise
6	Sustainability related expertise is allocated in the corporate supporting departments, which are service providers to the tenders – and projects. If the need for social and environmental expertise becomes not apparent from the tender documents, supporting departments are oftentimes consulted late, as tenders tend to be under strong costs constraint, so that they must run with minimum resources	5	1		# consulted late yes, but not for cost reasons, but due to lack of interest, or lack of awareness, or because they perceive the client would not be interested # not yet in the way of thinking to consult such expertise per se

7	Sustainability related costs must be covered by the tender, or project budget, which implies, that either the client must be willing to pay, or the project's turnover must be sufficiently large to cover additional costs. This in turn significantly affects the possibility to strive – and make room for sustainability integration pro-actively	2	2	1	# big discussion, whether sustainability should be seen as costs, or not # in many projects, sustainability costs are marginal, though indeed tendency to stick to traditional practices for smaller tenders # it is not the case yet, that sustainability is seen as an investment # under current market conditions and based on the client, this is how it works #upon follow up question: it would make sense to allocate corporate budget for experimenting with sustainability and drive change to be less dependent on the client's willingness to pay #willingness to pay relates to finding opportunities # at present, oftentimes, especially less tangible solutions i.e. stakeholder engagement plans etc. must find their own projects, where they find support, not on corporate level
8	Integrating costing, risks and sustainability leads to project optimization and direct benefits for the client, which helps to explain the added value to the client	5		1	#discussion on wording
9	Integrating costing, risks and sustainability helps to address potential trade-offs, as the added value of sustainability will become more transparent	5	1		# actually all agree, only the word trade off requires clarification as sustainability is such a big term
10	Integrating costing, risks and sustainability is not being effectuated in a structured process throughout the organization	4	1	1	# all agree not effectuated in a structured process, but respondents see it increasingly coming
11	The distinction of areas and business units may lead to a set of similar client profiles, characteristics and legislations for tenders. Thus, a modular framework can be established tailored to the business unit, so that per geographical area and BU a template exists, which set of focus areas apply – and what the important points to consider are (i.e. given legislation etc.). From that, individual tenders can start and tailor the sustainability approach according to their needs.	3	2	1	#1 agree to some extent, but limited # Within most BU's the projects and their backgrounds/drivers are really specific and the 'focus areas' vary a lot even with very comparable projects and peers. # it can help but every project is very specific
6	**management control**	Agree ++	Disagree -	NA	**Remarks**
12	Having management control measures in place is a means, by which leadership (i.e. commitment and guidance) can be effectuated into processes, transparent assessment criteria and deliverables to guide towards sustainability considerations throughout the tender process.	4	2		# but not as important compared to other factors, can be coming upon remaining aspects are clarified # might be too formal, sustainability should not be complicated, but as safety become part of how we do business #The trick is how to create such control measures or actions to assure that leadership is translated to practical and tangible solutions.
13	For tenders and projects, it is needed to formulate corporate sustainability ambitions in a S.M.A.R.T.* manner	4	1	1	#discussion semantics of sustainability # quantification is needed i.e. based on focus areas such as CO2 # generally agreeing, but must not be too formal # It would be helpful, but it is not necessarily required per se. #not needed but helpful, if it was there
	Project Environment	Agree	Disagree	NA	**Remarks**
6	**Collaboration & Communication**	++	-		
14	More multidisciplinary teams will encourage discussions on sustainability, as different perspectives are looking at the same problem.	6			# considered very important # So true, please assure that more disciplines are hired! (FYI this is one of the strong points of Env Eng dept, our multidisciplinary team)
15	Cross-departmental integration of sustainability related information and initiatives, in form of a centralized coordination point, is needed to ease retrieval of relevant information under time constraint and to reduce present silos. This could be i.e. take the form similar to the existing PQ tender desk.	5	1		# SEA program first approach, but more tangible information, of who does what is needed (an overview of capabilities across the organization from which tenders can choose)
16	Joint planning and close client interaction, already during the tender phase, are means by which misalignment between the client's objectives and VO's sustainability intentions can be overcome.	5	1		# would be very helfpul, but limited extent possible as many clients do not want to talk during tendering #true, but are we alowed for interactions? # only needed, if client not professional in his requirements

17	What the clients asks for in the tender documents is not necessarily, what he wants, or what he needs to optimize performance. By engaging with the client early on, it is more likely to identify customer value and hence to take a more effective approach towards sustainability in the tender / project.	5	1		# same, while that is desireable, not always feasible as the market works, because client does not want to interact, or change requirements
18	By tackling customer values, it is possible to integrate sustainability pro-actively beyond the requirements, as the client will be more willing to incorporate such aspects	5	1		#not all clients are driven by sustainability values clarification during discussion: not per se sustainability values, but author refers to the outcome i.e. enhanced reputation, getting project finance; agreement obtained
	External	Agree	Disagree	NA	**Remarks**
7	**Socio-Economic Context**	++	-		
19	Knowing the client's socio-economic context and his values helps to persuade the client of added value beyond his/ her requirements (i.e. based on finance institutes, regulators, NGOs, or local stakeholders).	6			# Fully agree, but obtaining 'systems knowledge' on the environmental and socio-economic system requires 1) early involvement and thus 2) investments # something to improve within VO
20	The strong focus on requirements bears the risk of overseeing opportunities, which are needed to integrate sustainability pro-actively, but also to differentiate compared to competitors	4	1	1	# not sure, if focus on requirements is that strong, too hypothetical # The risk is always there. However, it depends on how you deal with the risk whether opportunities are identified and seized # See BwN1 mission statement: Thinking, acting & interacting differently

KEYWORDS

sustainability integration, marine infrastructure projects, contractor, success factor model, tendering, organizational change

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