

BEST PRACTICES IN CROSS-SECTORAL COLLABORATION IN CLEAN SHIPPING PROJECTS

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EXECUTIVE SUMMARY

One of the objectives of the CSHIPP project was to find out best practices for industry-academia collaboration by mapping experiences from past and ongoing projects. This report passes on these insights and presents the lessons learned for the wider network. Table 4 (pp. 36-37) summarises the key findings emerging from the study.

This study is based on data collection via a literature review and expert interviews. In addition to exploring written sources including scientific papers and other publications, several individuals were interviewed during the project (for a list of participating organisations, see appendix). The interviewees were asked to describe their experiences of cross-sectoral projects and give practical examples of successful collaboration circumstances in order to make sure that the best practices are based on actual situations and are found to be practicable.

Cross-sectoral collaboration is vital when the challenges are so wide-ranging and complex that one sector – let alone a single organisation – cannot solve them alone. It became clear that external funding allows partners to step out of their organisational silos and engage in collaborative work. Successful collaboration creates synergies and pushes partners to better performance. Moreover, university-industry collaboration creates a good combination of practical and research-oriented people and a platform for sharing ideas and expertise.

Among the interviewees, the general attitude towards cross-sectoral cooperation was positive. The interviewees found that there are many things that the project partners can learn from each other. Among other things, universities have wide information resources and usually more freedom to explore without looking at the payback time. On the other hand, companies have ‘real-life’ data and practically-oriented information, which universities need in order to achieve meaningful research results.

It should be acknowledged that the sector-specific objectives may obstruct collaboration. The respondents noted that academics tend to focus on lengthy research and publications while the business sector finds quick and practicable development tasks more important. The working methods are often different and can cause friction when working together. Companies tend to have a shorter time span and acute business-related tasks, and consequently no time for long-term academic research. This is important to take into account as many academics found involving the business sector difficult. A general recommendation would be to find some middle ground in the project tasks in order to fit these differences together.

The findings show that there are some boundaries (i.e. figurative demarcations in this connection) between the sectors. Most evidently, information transfer becomes difficult

when experts collaborate across sectors due to the specificity and complexity of the information. Summarising and simplifying the message is often necessary in order to reach a desired outcome. Well-tried practices include, for instance, animations, short videos and story maps.

Cultural and political boundaries did not play a major role in this study, possibly because many participants knew each other from earlier projects. Consequently, trust came up as the single most important factor when working across sectoral boundaries. However, building trust is challenging if the partners do not know each other beforehand. This is why the role of informal gatherings should not be downplayed, since formal meetings are arguably not the most efficient way for people to get to know each other.

Moreover, many respondents wished for more frequent meetings while acknowledging that getting a geographically wide consortium together is burdensome and time-consuming. One solution would be to organise smaller group meetings more often to ensure continuous information exchange. Online meetings can replace many face-to-face meetings but cannot substitute them: personal meetings still have many advantages, as pointed out by many interviewees.

Evidently, the more partners are involved, the more complicated it will be to coordinate the consortium. This finding highlights that in order to get the full potential out of a project, it is important to harness the whole group working together, not just pursue isolated tasks. Successful project management comes down to active communication. Importantly, communication should work both ways: the coordinator has only as much information as the partners share. Furthermore, a skilful coordinator can help the partners in the bureaucracy, which the business sector found especially burdensome. Nevertheless, every project partner should allocate enough time and resources to reporting and other administrative tasks in addition to output implementation.

1. INTRODUCTION

The environmental challenges in the Baltic Sea require cross-sectoral cooperation, thus bridging the sectoral boundaries between public and private is crucial. The Clean Shipping Project Platform (CSHIPP), a project funded by the Interreg Baltic Sea Region Programme, brought together seven existing EU-funded projects, their partner organisations, and stakeholders during the implementation period from 2018 to 2020. These projects consist of partners from businesses, governmental organisations as well as universities and research organisations, who all share the common goal of developing cleaner shipping in the Baltic Sea region.

The CSHIPP is an example of a collaborative venture where organisations do valuable cross-sectoral work on common challenges. One of the tasks in the CSHIPP is to identify best practices of industry-academia collaboration. This report is the output of work package 4.2 titled *'Best Practices to Utilise the Research-to-Business Network'*. The purpose is to map experiences from past and ongoing projects, and based on this, to provide insights into how to best capitalise the collaboration between project partners across different sectors, and draw best practices for the wider network. The focus of the study is in the geographical area of the EU Interreg BSR programme.¹

In order to acquire these insights, several participating individuals from partner organisations were interviewed between 2018 and 2020. The interviewees were asked to describe their experiences of and lessons learned from the project collaboration. They were also challenged to give practical examples of successful collaboration circumstances with opposing sector organisations in order to make sure that the best practices are based on real-life situations and found to be operable. To ensure a two-way communication process, the participants were given an opportunity to give feedback during the interviews. In order to connect the findings to earlier scientific contributions, the empirical data was mirrored against earlier academic works.

The aim of this report is to offer insights for anyone taking part in project collaboration, including ongoing and future projects, and those who are at the application phase, or even just planning first ideas or building a project consortium. Moreover, the results may benefit the industry and academia with or without prior experience of such collaboration wishing to establish a connection with each other.

¹ The programme cooperation area covers Denmark, Estonia, Finland, Germany (Berlin, Brandenburg, Bremen, Hamburg, Mecklenburg-Vorpommern, Schleswig-Holstein and Niedersachsen), Latvia, Lithuania, Poland and Sweden. Partner countries are as follows: Belarus, Norway and Russia (St Petersburg, Arkhangelsk Oblast, Vologda Oblast, Kaliningrad Oblast, Republic of Karelia, Komi Republic, Leningrad Oblast, Murmansk Oblast, Nenetsky Autonomous Okrug, Novgorod Oblast and Pskov Oblast).

1.1. CSHIPP Project

The Clean Shipping Project Platform (CSHIPP) connects projects and organisations focused on enhancing and promoting clean shipping in the Baltic Sea and beyond with an objective of increasing the impact and synthesising the project's results (Table 1). The activities are centred on two key themes: the environmental effects of the maritime industry and the business potential of clean shipping. The governing idea is that sustainable shipping and profitable business support rather than exclude each other. Even though the Baltic Sea region is a frontrunner in clean shipping, the gap between research, business and policy-making hinders faster development in the field. Thus, the CSHIPP targets its activities at these sectors and brings them into dialogue with each other, seeking to increase the overall capacity of maritime actors. Disseminating the results of several projects enables new ideas and synergies to emerge and flourish (CSHIPP 2020).

Table 1 Project partners

Lead partner
University of Turku, Centre for Maritime Studies
Project partners
Aalborg University
ATI Küste
Centrum Balticum Foundation
Chalmers University of Technology
Finnish Meteorological Institute
HELCOM
Helmholtz-Zentrum Geesthacht
Maritime Development Center
Maritime University of Szczecin
Norwegian Meteorological Institute
Swedish Environmental Research Institute
Tallinn University of Technology
The St Petersburg House Property Owners Association
University of Turku, Pan-European Institute
Associated partners
Danish Environmental Protection Agency
DFDS
EUSBSR PA SHIP
EUSBSR PA Transport
Finnish Port Association
Finnish Transport and Communications Agency
German Federal Maritime and Hydrographic Agency
J. Lauritzen
Kotka Maritime Research Centre
Short Sea Promotion Centre Finland

Swedish Agency for Marine and Water Management
Swedish Environmental Protection Agency
Swedish Transport Agency
Projects involved in CSHIPP
BalticLines
BSR Electric
ECOPRODIGI
EnviSuM
GoLNG
SHEBA
Startup Accelerator



Figure 1 CSHIPP partner meeting in Hamburg, spring 2019 (© CSHIPP)

1.2. Accomplishment and structure of the study

The research began in 2019 with a desk study designed to collect background information from earlier contributions. The desk study included a review of earlier project reports and scientific literature with the focus on collaboration in the project setting. As it is important to link the empirical evidence to earlier academic contributions, the author identified the most relevant academic works from the wide array of papers and theoretical frameworks. The Triple Helix model proved to be a widely-used framework for describing the cross-sectoral collaboration and it was chosen as a starting point. Thereafter, the focus shifted to the sectoral boundary framework. This choice allowed cross-sectoral collaboration and collective competence building to be examined in a project setting. Finally, a quick look was taken at

project management in collaborative projects. These frameworks will be discussed in more detail in the following section.

In order to narrow down the studied topic and ensure the focus on the most relevant aspects, the following research questions were formed. The main research question is as follows:

- How can sectoral boundaries be overcome in order to capitalise on cross-sectoral collaboration in a regional project framework in the context of clean shipping in the BSR?

In order to divide the main research question into manageable pieces, three sub-questions were formed:

- What kinds of opportunities and challenges exist in cross-sectoral work?

- What kinds of boundaries exist between the sectors and how can we cross these boundaries in order to achieve better collaboration?

- What is the role of project management in successful cross-sectoral projects?

The subsequent sections answer the research questions in the following order: section 3.1 answers the first sub-question, section 3.2 the second sub-question and section 3.3 the third sub-question. Finally, conclusions summarise the research findings and answer the main research question. Section 4 was added in order to present two recent and interesting example cases of cross-sectoral collaboration.

The desk research was supplemented with an interactive process and interviews with experts working for the CSHIPP and other EU-funded projects. After establishing the theoretical basis and research questions, the author formed interview questions and initiated empirical data collection. First, the author transcribed and analysed the follow-up interviews, which had been collected in 2017 and 2018 as part of the ECOPRODIGI project.² Thereafter, the author carried out in-depth interviews throughout 2019 and 2020 in order to gain detailed information on the project collaboration experiences. In addition, the author specifically interviewed project managers in order to include the lead partner perspective in the study. Furthermore, a group discussion was organised as part of a project meeting in order to reflect on the findings and provide an opportunity for an interactive session. Overall, the interviewees represented universities and research organisations, private companies and business support and other organisations. Only people who were substantively involved were selected; therefore, financial and communication managers were left out. A balance was kept between business and research organisations.³

² The author wishes to thank Elisa Aro, Milla Harju and Tapio Karvonen (University of Turku) for the recordings as well as ECOPRODIGI partners for insightful answers.

³ See appendix for a full list of interviewees and organisations

The main purpose of the study was to obtain personal experiences, lessons learned and best practices in collaborative situations. As the nature of the research problem is subjective and complex, interviews were seen as the most suitable empirical data collection method. Semi-structured questionnaires were seen as a best fit, as the prepared set of questions ensures structure and focus, while the format also allows flexibility with the questions and answers. The interviewees came from different backgrounds and their perspectives were somewhat diverse. Therefore, capturing the essence and range of insights was seen as more important than frequency of incidents. Multiple views of the same things carried more weight in the analysis. Most of the interviews were conducted face-to-face, and some via online tools and telephone (especially after the COVID-19 restrictions were set). Interviews were held in either English or Finnish. The language of the interviews did not seem to have a major effect on the responses, although naturally when speaking in one's mother tongue the language tends to be more vivid. The interviews lasted 45 minutes on average: the longest were more than 90 minutes long while the shortest were just 25 minutes. Finally, the interviews were transcribed and classified in order to arrange the diverse source material.

Over the course of the research, interim results were presented to stakeholders in the form of an expert article and an online column, as well as informal discussions. The findings were also presented in an online consortium meeting. Feedback received during the process was appreciated and taken into consideration.



Figure 2 Cargo ship in the Baltic Sea (© Krzysztof Kowalik)

2. PERSPECTIVES ON CROSS-SECTORAL COLLABORATION

This section looks at collaboration in the project setting through different theoretical frameworks. Cross-sectoral collaborative projects can take various formats such as single university-industry cooperation, strategic alliances and collaboration on national, sector, departmental or individual levels (Brocke & Lippe 2015, 1022-1023). In this study, similarly to the characterisation of Brocke and Lippe (2015), the focus is on jointly financed collaborative research projects, planned and carried out together by a consortium formed of representatives from business and research domains. Project partners share similar research objectives and provide interdisciplinary resources or competencies in order to fulfil these objectives. These kinds of projects are increasingly important for public and private organisations and are fostered by public funding agencies. For example, the funding programmes of the EU are based on multi-stakeholder models for research management, multidisciplinary research and cooperative activities in Europe and the neighbouring areas (Brocke & Lippe 2015, 1022-1023).

2.1. The Triple Helix model describing the innovation development

The Triple Helix model⁴ appears to be one of the most widely used frameworks in academic papers for analysing cross-sectoral interactions, so it has formed a natural starting point for this study. The model examines university-industry-government interactions, mainly describing their role in knowledge and innovation development. The idea is that the interactions between universities, industry and governments play major role in innovation and growth, contrary to what may have been the case earlier. Following this thought, in today's knowledge-based society where different sectors support each other in a collaborative manner, growth and innovation occur when the sectors merge (Rosenlund 2017, 22-23).

The Triple Helix model was originally developed in order to study the shift towards the triadic relationship in the knowledge society. The model is based on an assumption that the potential for economic development and innovations comes from the hybridisation of elements of university, industry and government by generating new kinds of social and institutional arrangements for knowledge production, transfer and application (Ranga & Etzkowitz 2013, 238; see also Lahtonen & Tokila 2014; Stanford University 2019). Triple Helix collaboration typically occurs through networks announcing government policies, research results from universities and collaboration requirements from the business. The model has two overall functions: knowledge and innovation generation, which take place through different activities

⁴ An extension of the triple helix model into a quadruple or even quintuple helix model has been suggested in order to include civil society, citizens, consumers and NGOs. Similarly, the Mode 1, 2 or 3 frameworks describe these matters from a slightly different angle (see e.g. Lindberg et al. 2014; Rosenlund 2017). For the purpose of this research, this discussion is less relevant.

in the so-called *knowledge, innovation and consensus spaces* (Etzkowitz 2008, 22-23; Ranga & Etzkowitz 2013, 247-250; Rosenlund et al. 2017, 153-154).

A knowledge space, which is usually the first stage, ensures the concentration of research resources on a particular topic, creating a critical mass of knowledge that generates technological ideas. This space is essential for creating and developing knowledge resources for strengthening the local, national and regional knowledge base while avoiding the fragmentation and duplication of research efforts. A consensus space, an arena of critical actors working together, ensures that regional actors are able to gain support and acceptability for new ideas and engage in blue-sky thinking for advancement towards a knowledge-based regime. An innovation space fills the gap in the regional development process, creating organisational invention and adaptation. An innovation space usually begins by creating an organisational mechanism to initiate knowledge-based development regionally, or it proceeds from the aims described in the consensus space. Ultimately, the spaces interact with each other in continuous transition and complement one another (Etzkowitz 2008, 75-89; Ranga & Etzkowitz 2013, 250; Etzkowitz & Zhou 2018, 127-129).

Table 2 Triple helix spaces and their characteristics (modified from Etzkowitz (2008, 81)

Triple helix spaces	Characteristics
Knowledge space	Cooperation with different actors, concentrating on relevant R&D activities and operations
Consensus space	Ideas and strategies are generated in various relationships among academic, public and private institutional sectors
Innovation space	Fulfilling the goals described in knowledge and consensus spaces, establishing and attracting resources such as capital and knowledge

Cross-sectoral interaction is particularly important in regional development, especially in the context of the European Union. The European Union as a multinational entity operates in a regional setting and encourages cross-sectoral cooperation in order to create regional renewal and overcome the barriers to regional development that nation states may limit (Etzkowitz 2008, 75-89; Etzkowitz & Zhou 2018, 2-4, 12-13). According to Todeva and Danson (2016, 2-5), regional development in Europe dates back to the launching of the more formalised European Structural Funds in the mid-1990s, which encouraged more incentives for governmental actions to support regional industrial cluster growth. Regional governments were transformed into strategy developers and facilitators in order to build regional capabilities to enhance skills bases, develop the local labour market, foster connectivity and enhance innovation and business support targeted at improving regional innovative capacity creation, such as through technology parks, research centres and business incubators. In addition, the European Commission emphasised support for innovation, skills and entrepreneurship.

One could argue, however, that in practice the Triple Helix-related policies have been realised through government-led approaches, and in this sense implementation of the model at the regional level is less straightforward (Todeva & Danson 2016, 4). Furthermore, in the context of the Triple Helix, collaborations have mainly been studied on an analytical level while the practice of these interactions is less established. The model has been used for conducting work and managing research projects, but in reality, the interactions between sectors can be more complex than the model suggests. It has also been argued that the model is theoretically weak, even though it is a helpful framework when evaluating collaborations. In fact, there is a lack of Triple Helix literature in regards to micro-level collaboration (Rosenlund et al 2017, 154). The Triple Helix model is expected to improve regional development, but it lacks project-level instructions (Rosenlund & Hogland 2014, 2). Furthermore, the model is sometimes used in different circumstances than originally intended, leading to vague outcomes (Rosenlund 2017, 24).

2.2. Crossing the sectoral boundaries towards knowledge co-production

Knowledge co-production could be described as different actors, such as researchers, company employees or civil servants, working together on a common problem with shared goals and developing skills and concepts together. This typically involves a number of actors – companies, users, regulators and interest groups – at every stage of the research. A growing array of literature highlights the social, political, methodological and epistemological barriers, which the actors may encounter when working together. Because of this, collaborative scientists and non-academics may encounter institutional and organisational differences. For instance, stakeholders may have been used in different kinds of knowledge or their needs, timeframes and expectations do not match. This may create challenges in initiating and organising knowledge co-production projects. The large set of actors also means more diverse motivational factors, expectations or incentive systems. For example, the main goal of researchers can be the publishing of scientific papers, while non-academics may need to focus on more practical matters. In other words, stakeholders often have different intrinsic and extrinsic motivations to produce knowledge together in niche areas. This means that to keep project participants motivated and incentivised in knowledge co-production projects, measures are needed to reconcile the differences and to keep project participants motivated (Boon et al. 2019, 1935-1937).

Ideally, collaboration leads to the creation of something that could not have been accomplished by one member alone, for example, due to the complexity of the task. Interpersonal competence becomes essential in collaborations because project members should be able to solve problems together and integrate individual competencies. Collaboration requires practical skills and working routines as well as clear processes. As important is the ability to interact and work together with other partners. However, differing goals or resource scarcity, among other things, may complicate the interaction. Achieving

shared understanding can be especially difficult with public-private partnerships. This is particularly so because partners from diverse organisations can similarly have underlying differences in their behaviours, values and attitudes, and even the information can be perceived differently. Furthermore, temporary alliances such as projects, which consist of employees from different organisations, may face difficulties because each organisation possesses unique organisational identities as well as different motives for the cooperation, which may create obstacles for collaboration (Ruuska & Teigland 2009, 323-324).

Cross-sectoral collaborations include partners from multiple organisations, often from geographically distant locations, which makes the work towards common goals challenging. Boundaries, which could be described as the '*demarcation between the organization and its environment*' (Santos & Eisenhardt 2005, 491), create further challenges. Boundaries are encountered between all kinds of forms of organised cooperation such as work groups and sectors, which are distinguished from each other by culture, occupation, discipline, identity, spatiality and knowledge. These characteristics become visible when working in a cross-sectoral environment (Rosenlund 2017, 31-32; Rosenlund & Rosell 2017).

Rosenlund et al. (2017) divide boundaries into three sub-categories: information process-oriented, cultural and political. Information process-oriented boundaries originate from different forms of failures when transferring knowledge. The reasons for this are varied. The knowledge may be positioned in specific groups from where it is difficult to transpose. For example, academic knowledge can be too technical or jargon-rich for other sectors to understand and academics can be perceived as difficult to reach and communicate with. To facilitate this, the transferring of knowledge needs established processes. For instance, the creation of informal networks involving mutual visits and discussions that connect partners' interests could improve mutual understanding (Rosenlund 2017, 32-33; Rosenlund et al 2017, 158).

Cultural boundaries derive from each sector's unique norms and values, which may result in the understanding of things differently. For example, academics may value thorough consideration but industry wishes to gain practical results quickly. These differences may create tension between the partners. As usually, the only way forward is to negotiate and compromise. This could be described as an ongoing boundary management, which sustains collaboration. In order this to succeed, actors must be able to communicate across boundaries and acknowledge the sector-specific contexts (Rosenlund 2017, 32-33; Rosenlund et al 2017, 158).

Political boundaries refer to an idea that knowledge is ultimately inseparable from the interests and actions of any individual. Similarly, each sector wishes to keep its original role but gain as much as possible from the collaboration. Gaining goodwill and marketing value, for example, could be the driver for a company to initiate collaboration with university. Vice

versa, a researcher’s main goal could be the publishing of papers and furthering their academic career. As every sector has a unique way of doing things and its own interests in cooperation, understanding the underlying motivations plays a major role in sustaining long-term collaborations. Trust and openness becomes important in bridging these differences (Rosenlund 2017, 32-33; Rosenlund et al 2017, 158).

Table 3 Managing knowledge across boundaries (modified from Rosenlund et al. 2017; 156, 160)

Boundary sub-categories	Problem	Solution
Information process-oriented	Incompatible routines or protocols that result in a breakdown of knowledge transfer (e.g. sector-specific text too difficult to understand)	Developing a common lexicon, appointing a person to help with the sharing/translation of information across communities (e.g. knowledge transfer using common report forms, appointing individuals who are able to help with knowledge transfer)
Cultural	Sector-specific norms and values, different ways of understanding, knowledge situated in practice (e.g. different ways of perceiving environmental problems)	Increasing shared understanding by negotiating, hiring or training individuals who can take boundary-spanning roles
Political	Knowledge is inseparable from the interests and action of any individual and sector-specific interests become limiting	Building relationships and common interest through practical and political efforts (e.g. increasing dialogue by arranging informal networks and meetings, cross-sector seminars, etc.)

Boundary spanning refers to different ways to facilitate the aforementioned boundaries, which cross-sectoral work may contain. The boundary spanning activities consist of an ability to (1) represent, communicate and maintain networks, (2) have management and information analysing skills and coordination of resources, and (3) possess essential knowledge within one’s own organisation and knowledge about external organisations. The so-called boundary spanners are individuals who are able to facilitate between different sectors and can help to overcome the boundaries. These individuals possess skills and personality traits that become useful in inter-organisational work. They build trust and sustain relationships, manage power relationships and organise networking. There can also be boundary organisations that mediate between the sectors and are able to communicate with all participating organisations. This becomes especially important when there is a need to resolve conflict (Rosenlund et al 2017; 36-77, 154-155).

Boundary-spanning takes place on the organisational and individual level. Boundary organisation mediates between sectors and provides space for common understanding and communication across domains, bringing the actors together. In this sense, boundary spanners are individuals who function as bridges between groups or organisations. These individuals cross physical and cultural boundaries; thus, they are important in stimulating innovation, transferring knowledge and building up trust and resolving conflicts between participating sectors (Rosenlund 2017, 36-27). It is important to improve the cross-sectoral dialogue in order to enable knowledge to cross the sectoral boundaries. Failure to do so will be detrimental to collaborative knowledge production. Cross-sectoral collaboration can gather together different competencies and solve complex problems. In order for this to succeed, collaborations require openness and open dialogue (Rosenlund et al 2017, 159; Rosenlund & Hogland 2014, 5).

Social networks play an important role in collaborative projects and boundary spanning activities therein. One way to analyse social networks is through Social Network Analysis, which can offer interesting perspectives on the personal and social linkages at individual and institutional levels. The analysis makes the social structures visible and shows how the actors are related to one another, showing the social capital of the actors and the network as a whole. The analysis helps to understand the nature of institutional or informal relations across border regions and identify important actors, flows of information and influencing capacity among actors (Jaansoo, 2018, 5-6).

In their maritime spatial planning-related research in Estonia and Finland, Jaansoo (2018, 36) found three types of formal networks: EU project-specific networks, international networks and national networks. Maritime sectors in both of these countries were well connected with all these formal networks. The networks also consisted of informal networks, which were grouped into person-based, organisation-based and sector-based networks. Informal networks were person-based and public sector-dominated, probably because maritime spatial planning typically belongs to the public sector domain in these countries. Furthermore, Jaansoo (2018, 32) found that cross-sectoral networking should be increased as the sectors impact on each other, and networking enables the development of the value chain. This is especially true in the maritime-related sectors, which are quite multifunctional by nature. Especially in the Baltic Sea region, networking needs to involve all the related parties, including land-based sectors.

2.3. Project management in collaborative projects

University-industry projects bring about additional complexity for project management practice because of the different organisational structures and cultures. The temporary nature of the cooperation leads to further complexity (Fernandes et al. 2019, 982). Even though university-industry research and development projects have been actively running for decades, understanding of this type of project management is still partial (Fernandes et al.

2018, 806).⁵ Not surprisingly, collaborative research projects encounter numerous challenges as regards to successful project management. Projects involve *'high uncertainty and risks, individually oriented project personnel, heterogeneous project partners which are located at different locations, and significant pressure in terms of creativity and innovativeness'* (Brocke & Lippe 2015, 1023). Thus, adaptation and adjustment in order to meet a project's particularities are critical for the success of a project. General management methods are not always enough, which is why project managers often follow the 'learning by doing' principle and set of methods in each project separately (Brocke & Lippe 2015, 1023).

Brocke & Lippe (2015, 1031-1032) mention three main challenges related to collaborative research projects: 1) Projects operate under uncertainty and project partners need freedom and flexibility to accomplish innovative results. However, uncertainty requires tight management to avoid failure, and creativity requires firm structures for being able to transfer into widely usable project outcomes. 2) Cooperative research nurtures the integration of views, ideas and research perceptions, which are required to solve problems comprehensively. But the resulting heterogeneity of partners results in inter-disciplinary, inter-organisational and inter-cultural management challenges. 3) The manager has just some authority because of the autonomy of project partners and governance structures. However, certain tasks require the commitment and involvement of all project parties.

Brocke & Lippe (2015, 1031-1032) offer four general strategies that may help to resolve these challenges: 1) The project vision should be defined together, communicated properly and used as a frame for project tasks. This reduces uncertainty and aligns different stakeholder views. 2) Compatibility should be kept in mind when choosing project partners. Ideally, the consortium members would have prior experience of working together in a comparable setting. Expectations should be talked about early and openly to avoid confusion or contradicting agendas. Proper communication, face-to-face meetings, and exchanges or training in inter-cultural working practices could improve compatibility during the project. 3) Allowing flexibility at the working level but keeping control at the project level ensures firm work structures with enough flexibility. Flexibility and firmness are both needed, and a balance between these should be kept, while avoiding overly binding guidelines for the sub-level tasks. Finally, it helps if the project manager has strong knowledge-broker and dialogue skills with a diplomatic attitude and understanding of technical matters, and also a delegating and participative leadership style.

⁵ For a more detailed study on project management approaches and practices, divided into project initiation, project initial planning, execution, monitoring, control, re-planning and closure, see Fernandes et al. (2018).

3. COLLABORATION IN CROSS-SECTORAL PROJECTS

This section presents the empirical findings derived from the expert interviews, which are reflected on the earlier academic contributions. The research questions will be addressed in the following order: (1) *What kinds of opportunities and challenges exist in cross-sectoral work?* (2) *What kinds of boundaries exist between the sectors and how can we cross these boundaries in order to achieve better collaboration?* and (3) *What is the role of project management in successful cross-sectoral projects?* The final section concludes the findings and answers the main research question: *How can sectoral boundaries be overcome in order to capitalise on cross-sectoral collaboration in a regional project framework in the context of clean shipping in the BSR?*

As a background note, at the time of the interviews the partners worked for CSHIPP and/or a regular EU-funded project (namely BSR Electric, ECOPRODIGI, EnviSuM or Startup Accelerator), or two regular projects at the same time. However, as many of the interviewees had extensive project experience, the purpose was to include generalisations about collaboration in a cross-sectoral project setting and not just focus on these projects. Most of the companies were typical expert organisations with a flat hierarchy and collaborative decision-making processes. The majority of the companies had consultative business models based on research and development processes and wide networks. All the companies had at least some prior cooperation with other companies, many also with universities. All academics had earlier collaboration experience with companies in addition to project management experience. The universities that took part were both regular partners and lead partners. Companies did not have lead partner roles.

3.1. Knowledge co-production and collective competence building

First, it may be of value to take a look at what actually motivates partners to take part in a project. Universities and private companies are of course completely different types of organisations, so what exactly are they expecting to gain by joining in a collaborative project together?

For academics, the reasons resembled much of the traditional roles associated with universities; namely research, education and societal discussion. Researchers noted that collaboration with industry enabled universities to do applied research based on 'real life' settings and have access to data and resources that they otherwise would not have. Companies' involvement was seen as important so that the academics would understand what is important from the industry's point of view. A Danish associate professor praised the good group of industrial partners, which brings together knowledge about different technologies, software and a varied mix of competence. Another Danish academic noted that this kind of project allows universities to access data that companies possess, which helps them to develop new applications. From an educational point of view, the projects gave

students an opportunity to participate in project activities and gain practical knowledge about the industry. As importantly, many academic respondents pursued the dissemination of knowledge and contributed to science through reports and journal articles.

Industry partners generally valued the possibility of product development, process optimisation and knowledge transfer together with academic partners. For smaller companies the project provided an opportunity to develop prototypes together with qualified partners with financing included. Larger companies appreciated the opportunity to develop demo cases before scaling them up. Some business partners also saw the project as a promotion platform, which they could utilise to show the governments and the public that the maritime industry has addressed the current environmental challenges. Overall, the project helped the partners to strengthen their products and processes. Emphasis was placed on improving the market position through cost reduction and improved technological development, which all came as a good by-product while aiming at reducing emissions.

Project partners from both domains saw the cross-sectoral work as rewarding, though challenging at times. Academics were mostly satisfied with the engagement of the industry, even though many of the companies were new to this kind of collaboration. As an important factor, the level of trust and openness between the partners was regarded as high and the companies were keen to explore new solutions. According to a Danish researcher, openness is essential for cross-sectoral work to succeed: the engagement of the project partners is of course always important but especially when the activity level of the companies affects the research results that academics can achieve. Another Danish academic echoed these thoughts: *'Commitment from the companies is crucial because it makes a difference if they invite researchers and engage themselves in and set directions where we should contribute [...] This is particularly important because the scarce resources have to be prioritised carefully.'*

Two Finnish academics noted that the project connects a group of top-level experts from different fields together. Combined resources make it possible to divide the work: one partner does calculations, another does simulations, and one examines how the target group perceives the information. When the information is created step by step, one organisation does not need to have all the knowledge or resources. As there are various types of project partners, such as intergovernmental organisations in addition to business and academia, the message is easier to transmit to political decision-makers. Furthermore, platform types of projects such as the CSHIPP, which are aimed at disseminating results, add resources to spreading the message.

Combining people and resources was generally highly valued by the business partners. A Danish SME director noted that the contribution of the universities is valuable because academics do not necessarily need to look at the payback time of product development and they can explore things more freely. A representative of a large Danish company described

the current consortium: *'It's a good combination [of partners]. All parties actually want to succeed, which is very positive attitude; people like to work together and share. It opens up new possibilities'*. Another representative from a large Danish company looked kindly on the current cooperation. This senior manager noted that that they have learned new things because the knowledge transfer and synergies work well, which has not always been the case as usually their company is not so interested in long-term projects such as this, but now they have allocated more time and resources and prioritised the project work more.

Most interviewees from the business sector liked the possibility of developing ideas further and creating solutions together. Russian partners highlighted that projects unite know-how and make the search for better solutions possible (sustainable waste management in this case). In fact, they had already created concrete products together with other project partners. A German partner noted that *'the project brings partners and ideas together and it is a catalyst for innovation,'* i.e. it encourages the creation of new knowledge and 'blue-sky thinking'. A Finnish SME manager noted that the project has been helpful in developing daily digital management systems, digital work design, transparent production planning, better use of existing methods, and new applications in place of old technology. Furthermore, the project helped to identify new ways of thinking and doing business in different ways, such as bringing the well-known ways of working in the processing industry to a project industry. In addition, the project and the EU funding were important in grouping together with people and stepping out of silos, and with cross-functional collaboration, the project improved the working methods and developed everyday solutions to daily problems. One particularly important thing for a smaller company was that the project offered an opportunity to do and implement things that would otherwise be beyond their business models and daily work.

The interviewees also saw many challenges in cross-sectoral project work. From an academic perspective, getting the business sector on board in the first place was considered challenging. Even getting business representatives to attend the project events was considered difficult, at least occasionally. Two Finnish academics noted that for universities, economic factors are not the determining factor, but the goal of companies is more tied to their economic activities. In addition, the perception of time is different. While the business sector tries to achieve the results as quickly as possible to maximise economic gain, research organisations tend to have different objectives. However, getting the business perspective represented is often crucial for a project's success. The interviewed academics contemplated that if it is difficult for the companies to engage for the whole duration of the project, perhaps the programme rules could be altered in order to enable a shorter commitment for some partners. While this is technically possible with a smaller budget share, in practice, taking part requires quite a long-term commitment.

From a business perspective, the university-business collaboration included a few key challenges. Perhaps most evidently the different methods of working and the different

workflow of the organisations were seen problematic. Many interviewees had concerns that the work would get ‘too academic’— focusing too much on the theoretical side to the detriment of actual issues. Some were worried that the project might turn out to be a mere theoretical exercise, not something that could be put into practice. A Danish SME manager expressed the concerns in the following way: *‘It is important for us as a company that we get something out of it. It is a risk if we let the universities run too far, it might be more of a theoretical exercise and not something that could be put into real-life work. It’s important that something real comes out of the project.’* Parallel to this, a Danish SME director noted that it would be important to connect the academic research and the practical work within the companies more closely. Universities could be a kind of external research resource for the companies; they could advance their research but also help carry out the company’s goals. Building this kind of relationship takes a lot of effort from the universities and companies and often it would be helpful to have a designated person for the research collaboration.

Many interviewees felt that the ‘velocity’ is different in business and research domains. A Danish senior manager remarked that when stirring people in the industry, they also expect at least some quick preliminary results. As a result, academic papers to be published in the future are not enough.

‘When we instigate and stir people in the industry, we have to be quick and focused. That will lead to the best response in the industry. Otherwise, they will think this is too academic and too theoretical. That is the challenge. Now when [academics] go out and disturb service people working on a daily basis we have to respect that in terms of how much we ask them and how much we take their time and how fast we can deliver at least some preliminary results.’ (Danish organisation leader)

These thoughts were often repeated. A director from a large Danish company noted that sometimes there is a tendency to deprioritise ongoing long-term projects if there are more acute daily business-related tasks under way. If this happens constantly, it can delay the project proceedings. A senior manager of a large Danish company pointed out that in general they like things quick and if something looks interesting, they tend to find out rapidly whether it makes sense to them or not. This lack of patience was the reason why long-term projects have not been so attractive to them. A Finnish SME manager noted that the ‘clockspeed’ is different in the university and business domains, and some means to bridge that difference would be useful. For instance, when companies encounter some kind of problem, they need to figure out the solution right away; waiting for the next consortium meeting is just not possible. As a result, it would be good to find some middle ground in the project tasks, because the business side tends to get impatient and frustrated with projects that persist.

Furthermore, as stated by a manager of a Finnish SME, companies’ and universities’ research objectives do not always match. For instance, in an earlier project universities wanted to do

research on something that had already been implemented by companies some time previously, so the necessity of the research was difficult to understand. According to the manager, based on earlier experiences, universities' research activities and companies' development goals do not always cross paths. The manager suspected that this is the reason why so many in the business sector do not see the benefits of university-business collaborative projects, even though they can provide a genuine opportunity to develop business activities. In some cases, the opportunities are seen initially but finding the right people in a consortium and starting the cooperation is too complicated and the motivation gets lost on the way.

The regular face-to-face project meetings and events were generally viewed as useful events to come up with new and compare existing ideas. As an example, a Finnish SME manager mentioned a 3D scanning workshop, which concretised the research ideas. Workshops and training sessions group people together to talk, and those kinds of events tend to interest people. And if the events are within a close distance, then they are of course easier to attend. A Finnish SME manager suggested more frequent smaller-scale meetings, while acknowledging that this might not be easily arranged with the geographically wide consortium. Regardless the challenges, this would be a more familiar way for companies and would bring them closer to the business projects with biweekly meetings. In fact, many interviewees wanted more frequent meetings with informal gatherings and a more fluid information flow in terms of other partners and their progress. A Swedish researcher pointed out that it would be good to have more regular information on how things are going in the project. A Finnish business support organisation manager noted that with large-scale projects with many partners, one cannot overemphasise the importance of regular meetings and personal interaction.

One well-tried solution, as a German SME representative pointed out, would be to organise online events such as webinars if frequent physical meetings or conferences become too difficult to organise. On the other hand, as one academic partner noted, online meetings have replaced some face-to-face meetings, but they cannot be a complete substitute even though the face-to-face meetings take a lot of effort from the attendees. Another academic commented that online meetings are a good tool, but if there are numerous attendees, it becomes less controllable and the discussion gets easily side-tracked. Online meetings ease daily life by reducing the need to travel, but face-to-face meetings improve cooperation, at least at the beginning when getting to know each other is important. Thereafter, it is easier to proceed with substantial matters. And it also depends on the stage of the project: when there are many things going on, then meetings even once a month would be advantageous.

3.2. Overcoming sectoral boundaries

In a project with many experts from different fields and complex substance matters, knowledge transfer can create challenges. According to two Finnish academics, when talking

about technical matters, not everybody may be familiar with the substance. It is also important to take into account the target group, which depends on the project. For a full impact, it may be necessary to explain and simplify the outcomes so that the target audience is able to understand. Scientific papers, for instance, may be too complex, specific and time-consuming for the business sector or governmental authorities. Topics such as emission reduction and the related technology can be very hard to understand for someone from outside the field, even though an expert may think it is easily understandable. With regard to this, there are some well-tested dissemination formats to summarise and simplify the information. For example, animations, short videos and story maps have received positive feedback from the stakeholders. This is also where the platform projects have proven to be useful as they offer the time and resources to transfer the results into short, clear and understandable chunks.

Overall, both business and university partners considered good communication — and knowledge transfer thereof — the foundation of a successful project. The partners had predominantly good communication-related experiences. Even companies that were technically competitors were generally willing to share information with each other, even if it was not entirely in their immediate interests. The benefits of collaborative work were commonly understood and the project partners were eager to learn from each other. This included, for example, learning about the technological state of play of the region as a whole, widening the networks and gaining ideas for future projects.

The companies valued access to universities' information resources and many interviewees mentioned that they had learned new things from the academic partners, particularly because universities also possess a wide range of information about other industries, such as the automotive industry. A German SME partner emphasised that the cooperation *'creates opportunities for communicating and information exchange.'* When talking about cooperation, a Finnish SME manager stated: *'For sure we get to hear about technologies.'* A Danish SME director noted that academics are able to examine industry processes with fresh eyes and new methods. Moreover, a Danish large company representative noted that *'[we] also learn about other technologies which are not related to the project. It creates value just sitting in the same room.'*

However, cooperation, especially at the beginning, takes a lot of effort. Finding content alignment between sectors requires recurrent talks, face to face if possible, and informal meetings, since collaboration is ultimately interaction between people. A German SME manager noted that *'collaboration in any kind of project can be broken down to a personal level and if you can work together with people, then it works.'* Similarly, a Danish partner pointed out that forming the right level of communication with someone with a different background comes down to personalities:

'As long as you are open-minded and listen what others have to say, then sooner or later you are going to get an alliance and find your way. We have had long discussions where [researchers] come with a set of ideas and we try to understand how we can use that in our daily business, and that takes a lot of communication back and forth. If everybody shows up open-minded and ready to discuss, and is willing to give a little bit, then it works well.' (Danish large company director)

People in cross-sectoral projects may encounter cultural-related boundaries, such as sector-specific norms or values, different ways of working or different perceptions in general. The interviewees did not, however, mention this as a major challenge. According to two Finnish university partners, in terms of implementing the project tasks, they did not consider cultural issues as challenging — perhaps because partners had prior experience of working together on an EU project. A Finnish project manager noted that the perception of time and deadlines can be different with some of the partners but the explanation could also be that organisations typically have several ongoing projects and priorities elsewhere. For the coordinator, the current project is the most important, but regular partners may have responsibilities that are more important from time to time. Different organisational types are not necessarily to blame: there are people in every organisation who want to do things punctually, and both companies and universities have made time for project tasks even if it has been difficult sometimes. Generally speaking, if things are important for the partners, they will invest 100%.

Furthermore, as another Finnish academic pointed out, the work ethics, culture and working methods are similar around the Baltic Sea. There could be some cultural- or person-related misunderstandings, for instance, when some partners would like to proceed straightforwardly and others wait until the issue is conversed thoroughly. Some nationalities may have a little different way of doing things. In Russia, for instance, creating connections, building trust and dealing with bureaucracy is quite different from elsewhere in the Baltic Sea region. Also, some administrative systems are different [e.g. centralised or decentralised first level control], and do not always follow the project's reporting schedule. This is not a major issue, but it helps to take into account that things proceed at different speeds and in a different order in each country. Being aware of this and not leaving them to the last minute is important.

Cross-sectoral cooperation may also contain challenges related to sector-specific interests and actions, and an unwillingness to adjust the way of doing things, which may lead to conflicts between the partners. This was not a common challenge, but neither was it completely unheard of to partners. A Finnish academic looked back on an earlier project where cross-sectoral cooperation became difficult because of competing objectives related to sea area use. Sometimes the explanation is just people coming from different worlds of experience and thus perceiving things a little differently, as a Finnish SME partner stated. A German SME partner noted that some smaller obstacles may occur related to different

opinions, but this is normal and nothing that could not be solved easily. A Russian partner pointed out that minor conflicts of interests may emerge but these can be solved through negotiation. Overall, as a Finnish academic put it, we are all in the same boat and people are willing to compromise; nobody will stubbornly fight their views.

Boundary-spanning refers to different ways to overcome the aforementioned boundaries, while the boundary spanners are individuals who are able to facilitate between different sectors. As regards boundary spanning, the importance of trust and trust-building were referenced on several occasions. According to a Russian partner, a good way to build trust and relationships with companies is to cooperate on something. For example, a university could send a student or a trainee to work with the company, help in their daily tasks and provide academic insights. After working together, it is always easier to start to build on cooperation. An Estonian researcher pointed out that cross-sectoral cooperation is easier to initiate if the researcher is able to present some results to a company. It is better to begin by offering a solution to some problem instead of just asking for a contribution. Universities can offer exposure, for example, based on the data from the companies or letting the companies participate in the writing of papers. Trust is a major issue and the best way to gain trust is to offer some useful solution: *'It has to be a give and take thing.'* (Estonian academic.) A German SME partner remarked that gaining trust starts with developing your own research and results. When there is something interesting to offer, building trust becomes easier. However, an Estonian academic noted that while it helps if you know what the company needs, it is not always possible to have this information.

Networks are a cornerstone of the maritime sector in the Baltic Sea region and this was mentioned several times in this study, too. Most of the interviewed companies possessed wide networks. The companies were typically well connected and possessed wide networks in the Baltic Sea region — at least with other companies, and others also with universities. Regionally, clusters were seen as an important way of uniting similar and complementary areas of expertise. The research organisations that took part had at least some earlier cooperation with companies. While both companies and universities valued their networks, the reasons for doing so were different in some respects. For many academics, the networks were considered important for gaining first-hand information and increasing the understanding of the wider public through the project networks.

On the other hand, many companies appreciated the opportunity to work in a wide network and develop ideas. This was particularly the case after getting to know the partners first and learning how to make use of the resources in the widely-spread project network. Two partners commented on the networks as follows:

'[It is] interesting to be part of a project because you get new ideas and meet new people and widen your horizon, and it opens up new opportunities for cooperation later on. The

networking part is also important [...] after the project I hope this will open up doors for future projects so that we have a bigger network, know more companies, have more information and ideas, which companies we should and can work with.’ (Danish SME director)

‘It is also exciting to find out what sort of resources we have in the region because if we want to stay in business and be successful in this part of the world we need to constantly improve and be better because there are a lot of really clever and dedicated people elsewhere that will compete with our products. So whatever we can do to spread our network and work that base is a benefit.’ (Danish SME manager)

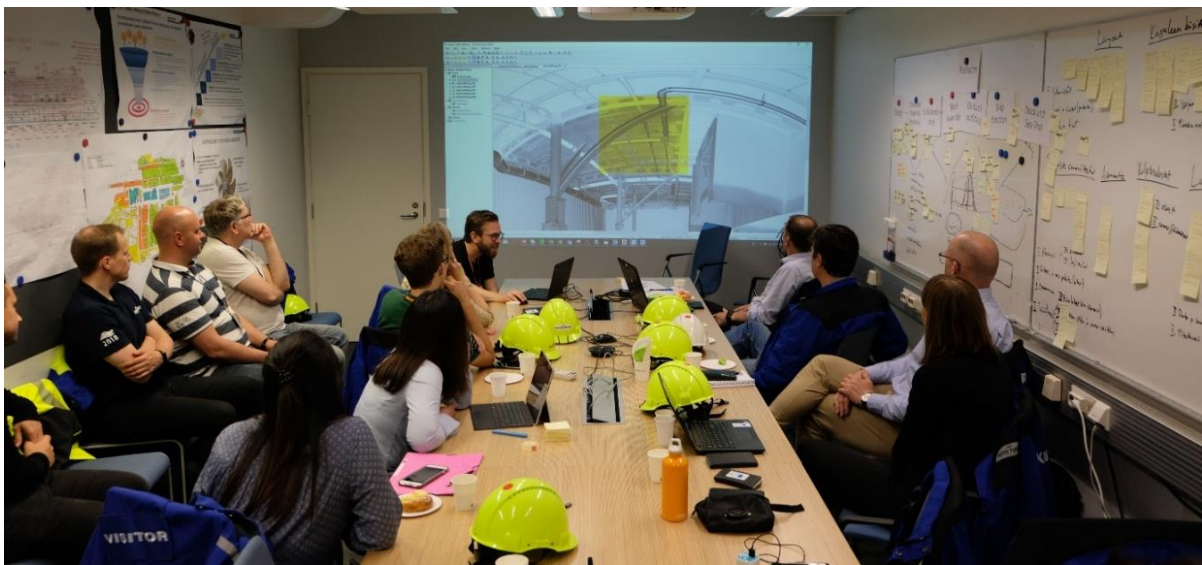


Figure 3 3D scanning workshop at Meyer Turku Shipyard, spring 2019 (© ECOPRODIGI project)

3.3. The role of project management

Successful collaboration is in many ways dependent on successful project management. Two Finnish lead partner representatives listed some of the most important tasks of the project manager in a cross-sectoral project. Following up on the work and making sure that it is carried out according to the plan is of course important. The project manager needs to maintain the overall picture, pull the strings, know what each partner is doing, and make corrections when necessary. Successful management comes down to active communication and keeping up with partners regularly, as the coordinator has only limited means of control over the partners. However, communication should work both ways and this means active communications from the regular partners as well. The project management becomes difficult if the partners do not share ongoing activities or other relevant information. Unavoidably, with a large consortium in a geographically wide area, some of the information disappears. The larger the project is, the more challenging it is to receive the required information. Therefore, coordination requires constant communication, both internal and external. Moreover, the sole purpose of the project meetings is not only dealing with the

administrative tasks, but also connecting partners and linking their expertise together. In addition, the project manager is the face of the project for the stakeholders and external audiences and is responsible for reporting to the financier.

A Danish academic noted that a large-scale project should make sure that there are enough resources for administration and project communication. The interviewee pointed out that in contrast to some earlier collaborations, the current project involves an appointed communications manager, thus allowing other partners to focus on the technical activities. In many earlier projects, resources have not been dedicated specifically to communications, which means that even the most basic communication, such as setting up a project web page, could be neglected. A Norwegian academic noted that keeping track of the planned activities is important: *'Since the budget for partners is small, the key is how to use resources. [...] And WP [work package] leaders need to make sure they are working together, so that the lead partner and WP leaders need to take care of the coordination.'* Limited resources always set some barriers, as one academic partner noted:

'You can only do what you can [...], work smart and leverage resources, synergies with other activities in university such as student support, [and search for] synergies with other research projects. And it is also important to find out how to cross cases and work packages [in order to] create synergies and not only isolated efforts, but create and learn together.'
(Danish researcher)

The lead partner representatives pointed out that ongoing cooperation usually works fluidly if the partners have had earlier collaboration with each other. Naturally, if you know people beforehand, it is also easier to work with them. Consequently, if the partners have not been in contact with each other before, initiating the collaboration becomes more difficult and takes more effort. So the new people and organisations need to learn the ropes, but also build trust and develop an acquaintance with each other. In order for this to succeed, it is always good to have less formal events between the consortium meetings.

Based on the responses, it could be said that although every partner should make sure that they have enough time and resources not only for project activities but also for reporting, skilful coordinators can ensure that everybody can focus on what they do best. Project management should ensure that the project partners are able to focus on those things that led them to join the consortium. In order to improve cross-sectoral cooperation, universities can work as an intermediary organisation between business and governments. Universities are often able to focus on topics that are out of the reach of companies due to time or resources. For example, as a project manager pointed out, companies often need to adapt to new clean shipping regulations. Universities have compiled different adaptation strategies related to new technologies and fuels, and the financing thereof — and best practice reports where the information is easily available. Facilitating the bureaucracy is another thing that

universities can help the companies with. Universities can take a coordinating role, which gives companies the possibility to focus on a more specific topic that is often more interesting to them. If the collaboration offers genuine benefits for companies, they will attend actively and bring forth their views.

In many interviews, companies acknowledged the important advisory role and the project coordination skills that the academics possess. Support with reporting was considered particularly helpful, as many companies saw some of the project-related responsibilities as frustrating, at least occasionally. It became clear that the project involves a lot of administrative burden, especially if the partners do not have previous EU project experience. A representative of a large company emphasised that technical issues are their core subject, but with reporting they are less confident. Some smaller companies lacked both the experience and the skills to manage the sometimes-complicated reporting procedures. A Danish interviewee confirmed that the administrative procedures and workload have been heavier than they expected. Universities generally have more experience of project reporting and they can ease the bureaucratic burden for the companies. For example, a large company representative was grateful that an academic partner lightened the bureaucratic burden for them by helping out with the form-filling, which was a major driver for making it simpler for them to participate in the project in the first place. This was particularly helpful because the academic partner had prior work experience in the industry and a good understanding of how things work on both sides.

On a more critical note, some companies wanted more precise direction, such as clearer instructions on what is expected from them in terms of practical work order. Some partners felt that they did not have enough contact with other partners. The work order in – and between – the work packages was considered unclear according to some partners. A representative from a large company noted that *'information sharing between the work packages is important. Sometimes you are involved in a project, but do not know what happens in the other parts.'* One business representative had not received enough necessary information from their work package leader, did not know with whom to cooperate and, therefore, did not know how to move forward. Thus, it was frustrating for them since they were not able to participate and use their expertise. Another company representative noted that the overall project structure is clear but the roles were unclear in their work package, perhaps because there had not been enough communication so far. More meetings could have been beneficial in terms of personal relationships and better implementation of activities.

4. EXAMPLE CASES

4.1. Norsepower and Viking Grace

In 2017, the Finnish clean technology and engineering company Norsepower started a two-year project⁶ co-funded by the European Commission's Horizon 2020 project. The main objective was to implement a 24x4 rotor sail unit on board the Viking Line cruise ferry Viking Grace, carry out demonstrations and gather information to validate its efficiency. The performance was instigated by several external organisations in order to determine the potential fuel savings. After the measurements, even though the savings were not immediately evident, it was confirmed that the technology could in fact deliver savings: on M/S Viking Grace, long-term LNG marine fuel savings are expected to be up to approximately 300 tonnes annually.⁷

Before applying for the H2020 funding, the company already had one rotor sail unit installed on a cargo vessel, according to Norsepower's CEO Tuomas Riski. However, the company sought to extend the market to ro-pax vessels. With the H2020 funding and with customer cooperation with the shipping company Viking Line, Norsepower was able to fulfil the objective of building a reference case and carry out measurements of potential fuel savings.

According to Riski, mechanical sails were not used on ro-pax vessels, thus the technology required numerous measures as well as safety and risk analyses. Collaboration with research organisations, namely Chalmers University and the Maritime Training Center Aboa Mare in addition to two companies, helped carry out these studies. Aboa Mare ran the safety simulations and Chalmers measured the fuel savings with the data collected by Norsepower.

Collaboration between the two organisations was based on somewhat different premises. Aboa Mare provided commercial services, although the customer relationship resembled project collaboration. For Chalmers, the motivation to participate was mostly derived from the academic interest as the university had ongoing relevant research. Nevertheless, Riski noted that the collaboration brought about considerable added value. Aboa Mare's simulations enabled the study of safety, passenger comfort and manoeuvrability.⁸ Chalmers went over the data sets with varying analysis methods, with the objective of finding out if, and how much, the rotor sail reduces fuel consumption. According to Riski, private companies tend to perceive given topics using a black box approach; that is, focusing just on the given variable. Chalmers, as a university, was able to study the phenomenon with a wider scope. Hence, the analyses with varying methods generated a comprehensive understanding.

⁶ Norsepower Rotor Sail Solution demonstration project (RotorDEMO)

⁷ For technical details and more information, see <https://www.norsepower.com/cruise-ferry/>;
<https://www.norsepower.com/post/independent-tests-confirm-norsepower-rotor-sail-savings-on-viking-grace/>

⁸ For the simulations, see <https://www.aboamare.fi/norsepower>

The cross-sectoral collaboration may possess some difficulties. People coming from different backgrounds may require some adjustments in terms of interests and schedules, but if participants are motivated to work together, it is not likely that the cooperation will encounter difficulties. Overall, Riski found the collaboration successful: agreeing on the research objectives, going through the results and the meetings in between went smoothly. The cooperation even continued after the project, as the researchers at Chalmers are preparing a research paper on the topic.

In addition, Riski noted that receiving the EU funding for developing new technology and bringing it to a new market was a great opportunity. Even the funding process — applying, implementation and reporting — was rather uncomplicated. Of course, it needed some work, but compared to similar projects, the EU project reporting was not too demanding. The most challenging and laborious part was the application phase, and if someone was lucky enough to receive the funding, after that the project is quite manageable.

As a closing remark, Riski noted that the project was a positive and successful venture. Being able to obtain successful reference case for a new, promising technology and connect it with a new customership and EU funding was a great opportunity. Hence, Riski encouraged start-ups and new technology developers to seek project funding for a collaboration project with universities, research organisations and other companies.



Figure 4 Viking Grace (© Norsepower)

4.2. ECOPRODIGI & DFDS

ECOPRODIGI, one of the seven projects included in CSHIPP, has been running since 2017 and is aiming to increase eco-efficiency in the BSR maritime sector by developing digital solutions in cooperation with companies and research organisations. Two ECOPRODIGI partners, Niels

Gorm Malý Rytter (University of Southern Denmark) and Mads Billesø (DFDS), summarised their journey so far and touched upon the university-business cooperation during the project. The following text is based on the presentations by Rytter and Billesø at the CSHIPP online conference on 14 May 2020 organised by the Danish cluster organisation Maritime Development Center.⁹

ECOPRODIGI consists of three industry cases, namely (1) digital performance monitoring and fuel efficiency of ships, (2) integrated and energy efficient RoRo logistics and (3) lean and digital shipyard processes. Each of the cases aim at developing and utilising digital tools and solutions in order to improve eco-efficiency. The University of Southern Denmark and DFDS have collaborated on the second case. According to Rytter, although it is a university-led project, the work follows the classical business improvement model with the purpose of finding concrete and profitable solutions. One of the observations has been that when digitalising operations and processes, it will be a long journey ahead. In the beginning, companies often underestimate the challenges ahead when seeking benefits through digitalisation. Thus, one of the objectives has been to formulate recommendations for companies: when a company should invest in digitalisation and how should they do it, taking into account technological investments, process development and people as part of all this.

Billesø noted that ECOPRODIGI encompasses the whole DFDS organisation including vessels, trucks, terminals and other warehousing services. In the beginning, the focus was on stowage process improvement by better ballast water management. However, it was soon realised that digitalisation could also benefit other areas such as terminal efficiency, load and discharge processes, fuel consumption and emission reduction, while making the business more sustainable. Since then the goal has been to develop real-time tracking of cargo units, smart gates, cargo tracking at terminals, planning operations with simulation tools, a more efficient loading and discharge process, and valid predictions of cargo arrival with customers. The collaboration with universities has helped DFDS to develop tools and algorithms that are required to achieve these goals and the project enlightens the actual impact of these services. Importantly, these solutions have been developed in cooperation with the company's IT department, thus many of the results in ECOPRODIGI have already been taken into use by DFDS. In fact, a number of meetings and workshops are now maturing at DFDS so the project has been worthwhile and productive.

As pointed out by Rytter, sea trials and simulations have demonstrated that digital technologies have visible potential for eco-efficiency gains. Based on the overall results obtained in ECOPRODIGI, it is feasible to expect 5–20% savings in fuel and material consumption, asset utilisation, operational expenses and emissions in the long term. While bringing about cost savings, the project contributes to a greener maritime industry. There is

⁹ For more information and the presentations, see <https://cshipp.eu/business-opportunities-in-clean-shipping> and <https://mdc.center/news-input/2020/5/15/the-business-of-clean-shipping>

not yet enough concrete data to show exact calculations, but with the eco-efficiency improvements, the project brings about considerable emission CO₂, NO_x and SO_x reductions.

To conclude, Rytter noted that digitalisation efforts require significant investments and a longer time frame than initially expected, but the investments will be returned in a relatively short time. However, it is important to remember that successful digitalisation needs a proper long-term strategy, a step-by-step implementation approach, commitment and effort from key stakeholders, and strong partnership with skilled researchers and subcontractors. However, as seen in ECOPRODIGI, it has the potential to deliver environmental benefits and provide a stronger competitive positioning of the maritime sector in the global market.



Figure 5 3D laser scanning of a DFDS vessel was carried out in collaboration with the Chalmers University of Technology (© Chalmers University of Technology)

5. CONCLUSIONS

This section concludes the whole study, summarises the findings and presents the lessons learned on cross-sectoral project collaboration in the context of clean shipping in the Baltic Sea region. Cross-sectoral collaboration is crucial when organisations want to tackle complex challenges that neither can solve alone. Ideally, the cross-sectoral collaboration creates synergies and pushes partners to strive for better performance. A project consortium, with the combination of practical and research-oriented people, creates a good platform for sharing ideas and expertise. But the higher the number of partners involved, the more complicated it will be to coordinate the consortium. It is important to cross the project work packages in order to generate synergies — and not just pursue isolated efforts but to create and learn together.

The interviewees in this study saw many opportunities for cross-sectoral collaboration, and mentioned many already fulfilled success stories. It is good to keep in mind what actually motivates the partners to join a collaborative project. Based on the interviews, academics wished to focus on research and education activities as well as contribute to science and societal discussion by publishing academic papers and reports. Collaboration with industry allowed universities to do applied research based on ‘real life’ settings and gain access to data and resources, which they otherwise would not have. Business representatives valued the possibility of product development, process optimisation and knowledge transfer together with academic partners. For smaller companies the project gave an opportunity to develop prototypes together with qualified partners with financing included. Larger companies appreciated the opportunity to develop demo cases before scaling them up. Emission reduction, technological development and cost reduction were seen as being interlinked and important.

Projects were seen as good platforms to connect experts from different fields together and letting them do what they do best. Typically, this would mean letting academics focus on theoretical research, companies on business development and applied research as well as intergovernmental organisations on dissemination and influencing. The partners argued that the opposing sector partners were able to do something that was more difficult to them. Moreover, the funding allowed people to step out of the organisational silos and engage in collaboration for a few years.

The collaboration included some evident challenges. University representatives noted that getting the business sector to join in with the collaboration and project activities was challenging, although it was crucial for meeting the project goals successfully. Both domains admitted that the ways of working can be completely different. Companies’ goals are tied to their economic activities, and they try to achieve results as quickly as possible. The business sector often needs to prioritise acute business-related tasks and the long-term project goals

can fall behind. The business side often expects at least preliminary results quickly, thus, academic papers to be published in the future may not benefit businesses. Therefore, it would be good to find some middle ground, because the business side tends to get impatient and frustrated. In addition, business representatives were concerned that the work would get too theoretical and not something that could be put into practice.

On the other hand, academics need more time for thorough research and the lengthy publishing procedures. Thus, the companies' and universities' objectives do not always match well together. Adjusting the business sector's development goals and lengthy academic research can be difficult. Thus, it would be important to tie together the practical work within the companies and the academic research, in order for them not to move too far away from each other. One well-tried option was to organise workshops, where the participants could share information and learn practical skills. For example, a 3D scanning workshop was able to successfully connect to the abstract research and demonstrate how to use the technology. For some organisations, it was difficult to commit for the whole duration of the project and, thus, in some cases, it would be beneficial to have an option to join the consortium for a shorter period of time.

Getting the geographically wide consortium together regularly seemed both useful and difficult. Many interviewees would have liked more face-to-face meetings while simultaneously acknowledging that having these meetings takes a lot of time and effort. Project meetings were generally viewed as useful events for information exchange and discussions, even though organising them and travelling were seen as burdensome. In fact, many interviewees wanted more frequent meetings and informal gatherings, which would allow for regular information exchange and catching up with other partners. One suggestion would be to organise smaller-scale meetings more often, which would be closer to the business-style project meetings. It should be noted that online meetings can replace some of the physical meetings, as seen during the COVID-19 period, but they cannot act as a complete substitute. Personal meetings still have important advantages, especially in the early stages of a project. As pointed out, finding content alignment and agreeing on project objectives and work plans are easier to discuss on a face-to-face basis. Later on, cooperation can be maintained with online tools.

According to many interviewees, information transfer becomes challenging when collaborating across sectors and grouping up with experts from various fields. To accomplish the expected outcome, the target group should be taken into account. In order to reach the desired impact, it is often necessary to summarise and simplify the outcomes. For example, policy-makers may not have time to read the reports or know the technical terms. Some of the well-tried dissemination methods include, for example, animations, short videos and story maps.

Partners from all sectors thought that good communication is the foundation of a successful project. Interviewees noted that information can be very specific and complex and not everybody may be familiar with the content. Scientific papers, for instance, may be too complex, specific and time-consuming for the business sector or the authorities. For example, emissions and the related technology can be very hard to understand for someone from outside the field, even though an expert may think it is easily understandable. Thus, discussing the project tasks is sometimes only possible on a general level. However, the interviewees also noted that the opportunity to learn from other organisations is valuable. Companies valued the wide information resources that the academics had, and academics the practically-oriented information that companies possessed. Many thought that learning from each other was the key motivator for collaboration.

Cross-sectoral collaboration may also entail culturally-related challenges such as sector-specific norms or values. The interviewees did not see this as a major challenge; perhaps partly so because most of the partners had prior experience working together on other projects. The importance of personal relations and bureaucracy had some effect; however, this was more related to differences between countries and nationalities, and not so much to different organisations. For example, administrative tasks such as auditing systems differ to some extent between regions. In addition, cross-sectoral cooperation may also encounter political boundaries, which refers to sector-specific interests and actions and an unwillingness to adjust the way of working. This was not a common challenge, but neither was it completely unheard of to partners. For example, maritime spatial planning includes various stakeholders who may possess differing interests.

Based on the interviews, trust became the single most important factor in boundary spanning, which could be understood as the ways to mitigate the difficulties emerging from crossing sectoral borders. However, building trust could be challenging if the partners did not know each other beforehand. Thus, the collaboration is easier if the organisations have prior experiences of working together. If the people and the organisations are new to each other, building trust and collaborative practices needs time. As a side note, it is never a bad idea to have some less official events between the formal meetings.

Collaborative projects also form a social network, and the network can play a crucial role in cooperation and boundary spanning activities. The organisations that participated in the research enjoyed wide networks, which is typical in the maritime sector. Furthermore, the project itself forms a network, which in some projects can be large and spread over a wide area. The wide network benefits the partners by giving them access to first-hand information and shared expertise. Then again, if the partners are new to each other, getting to know each other and learning how to make use of the resources takes time.

Successful collaboration is in many ways dependent on successful project management, as noted by the interviewees. This includes following up on the work and making sure that the activities are carried out as planned. This requires maintaining the overall picture, knowing what the partners are doing, and making corrections when necessary. Ultimately, successful management comes down to active communication and keeping in touch with the partners regularly. And the communication should of course work both ways; the coordinator has only so much information as the partners share. Especially in a large project, it is challenging to receive all the required information if the partners do not communicate actively.

Finally, the interviewees pointed out that, particularly in a large-scale project, there should always be enough resources for administrative tasks, even though limited resources always set some barriers. The interviewees noted that even though every partner should ensure that they have enough time and resources for the reporting and other administrative tasks, a skilful coordinator can help with the bureaucracy and ensure that experts can focus on what they do best.

Table 4 Summary of the key findings and best practices emerging from the study

Topic	Key findings and lessons learned
Knowledge co-production and collective competence building	<ul style="list-style-type: none"> • Cross-sectoral collaboration helps solve challenges that a single organisation is unable to solve alone. External funding allows partners to step out of the organisational silos and engage in collaborative work. • The collaboration should create synergies and push partners to better performance. It is important to cross the work packages and create and learn together, not just pursue isolated efforts. • Sector-specific objectives should be acknowledged: universities traditionally pursue publishing academic papers, provide education and attend to societal discussions. The business sector typically seeks to develop operative processes, production planning and management systems. In this study, SMEs appreciated the opportunity to engage in prototype development and large companies valued the chance to try demo cases before scaling them up.
Opportunities of cross-sectoral project work	<ul style="list-style-type: none"> • A consortium with the combination of practical and research-oriented members creates a good platform for sharing ideas and expertise. Academics tend to master the scientific/theoretical research and knowledge dissemination. Business organisations have a good understanding of applied research and development tasks. • Project partners possess sector- and organisation-specific competencies and they can learn a great deal from each other. Universities have wide information resources and usually more freedom to explore without looking at the payback time. Companies have 'real-life' data and experiences, i.e. practically-oriented information, which universities need in order to achieve meaningful research results.

<p>Challenges of cross-sectoral project work</p>	<ul style="list-style-type: none"> • From the university perspective, getting the business sector involved (joining a consortium and participating in events) was seen as being difficult. From the business perspective, ways of working were considered (too) different. Companies tend to have a shorter time span, acute business-related tasks and no time for long-term project goals. Companies often expect quick results that can be put into practice. • Objectives do not always match well together. Adjusting the business sector's development goals and lengthy academic research can be difficult. • Finding some middle ground in the project tasks helps in fitting the objectives and ways of working together. For example, having practically-oriented technology workshops, which provide skills for business attendees and generate data for academic purposes, benefits both sectors.
<p>Overcoming the sectoral boundaries</p>	<ul style="list-style-type: none"> • Information transfer becomes difficult when collaborating across sectors and grouping up with experts from various fields due to the specific nature and complexity of the information. • Keeping the target group in mind is of essence. Summarising and simplifying the message is often necessary in order to reach to desired outcome as stakeholders may not necessarily have time to go through lengthy studies or understand the terminology. Well-tried practices include, for instance, animations, short videos and story maps. • Sector/organisation-related cultural differences did not appear as major difficulties in this study, most likely because many participants knew their project partners beforehand. Diverse administrative systems between countries caused minor difficulties. Thus, different audit systems, for instance, should be taken into account. • Trust became the single most important factor in boundary spanning. But building trust could be challenging if the partners did not know each other beforehand. The role of informal gatherings should not be downplayed since formal meetings are not the most efficient way of getting to know each other.
<p>The role of project management</p>	<ul style="list-style-type: none"> • The higher the number of partners involved, the more complicated it is to coordinate the group. Successful management comes down to active communication and keeping in touch with the partners regularly. Communication should work both ways: the coordinator has only so much information as the partners share. • In this study, many wanted more frequent meetings. Organising smaller meetings more often would ensure continuous information exchange (e.g. biweekly group meetings). Online meetings can replace many face-to-face meetings but cannot substitute them completely: personal meetings have a clear advantage, particularly at the beginning of a project because finding content alignment, agreeing on objectives and discussing work plans is easier face-to-face. • A skilful coordinator can help the partners with bureaucracy, which the business sector in particular found burdensome. Nevertheless, every project partner should have enough time and resources for reporting and other administrative tasks in addition to output implementation.

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APPENDIX

List of interviewees, organisations and countries of origin

Organisation	Country	Number of interviewees
Higher education and research institutions		
Aalborg University Copenhagen	DK	2
Chalmers University of Technology	SE	1
RISE Research Institutes of Sweden	SE	1
Tallinn University of Technology	EE	2
University of South-Eastern Norway	NO	1
University of Southern Denmark	DK	1
University of Turku	FI	2
Large enterprises		
DFDS	DK	2
J. Lauritzen	DK	1
Meyer Turku	FI	1
Western Baltic Engineering, JSC	LT	1
Small and medium-sized enterprises		
ATI Küste	DE	1
Carinafour	FI	2
Kockum Sonics	SE	1
Logimatic Solutions	DK	1
Norsepower	FI	1
OSK-ShipTech	DK	1
Sininen Polku	FI	1
Vessel Performance Solutions	DK	1
Business support and other organisations		
Danish Maritime	DK	1
Island Ferry Secretariat	DK	1
Klaipeda Science and Technology Park	LT	1
Machine Technology Center Turku	FI	1
St Petersburg House Property Owners Association (representing Tyreman Group and other member companies of the St Petersburg Cleantech Cluster for Urban Environment)	RU	2
In total		30

Organisation types (in total)	Countries (in total)
Higher education and research institutions (10)	Denmark (11)
Large enterprises (5)	Estonia (2)
Small and medium enterprises (9)	Finland (8)
Business support & other organisations (6)	Germany (1)
	Lithuania (2)
	Norway (1)
	Russia (2)
	Sweden (3)



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