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CROSS-BORDER NETWORKS

A FEHMARN BELT INNOVATION PROJECT BY INTERREG DEUTSCHLAND - DANMARK

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Abstract

The Fehmarn Belt Innovation project has the ambition of connecting the regions of Zealand in Denmark and Schleswig-Holstein in Germany with the goal and ambition to strengthen the economies of both through innovation. This is important, as border regions are typically slow economic growth areas. The knowledge gap, as indicated by existing literature, indicates the lack of scientific discussion of the structural transformation from a newly developed cluster to a mature cluster and how such a cluster can be anchored and sustained. The research question for this paper is thus,

> "*How can the cross-border network existing of SMEs and cluster organizations in the maritime sector in the Fehmarn Belt region be sustainably anchored after the Fehmarn Belt Innovation project has ended in 2026?".*

This paper used the epistemology of modern hermeneutics through the ontology of pragmatism and an abductive approach to dive into the scientific field and add value to the discussion as well as the FBI project. Through an extensive literature review and 7 semi-structured interviews with project partners of the FBI project within the marine and maritime sector, main findings have been established. These include in-depth revision of terminology of regional innovation systems, clusters and networks, requisites needed to develop a successful network and challenges networks may encounter. The research leads to the conclusion of the requisites being mostly fulfilled with concern about active public support and implementation of network support programs and further, the identification of challenges in the areas of communication and structure. Lastly, the network being developed by the FBI project should strive to undergo structural transformation to become an international cluster network.

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1.0 Introduction

Innovation, technological advancement, and cross-border cooperations can make a positive impact on the corresponding economical regions, or can it? The Zealand region and the state of Schleswig-Holstein show slower economic growth compared to other regions in Denmark and in Germany. This has an impact on organizations, companies and the whole community working in these regions, slow economy results in businesses and skilled workers relocating leading to a shortage of both. Interreg Europe, which is co-funded by the European Union, focuses on programs regarding interregional cooperations. They cover various topics with the higher goal of equalizing levels of development, growth, and quality of life in Europe. Interreg has been active for more than 20 years with programs each running for a six-year period. The current project period runs from 2021 to 2027. (Interreg Europe, 2021) The Fehmarn Belt Innovation (FBI) is an Interreg project running from April 2023 until March 2026. The objective of the project is to strengthen innovation and growth for SMEs in the eastern part of the Fehmarn region. EU-funded German-Danish cooperation projects are not new. During the past Interreg project period, there was a German-Danish cooperation project running from 2014 to 2020. The analysis of the last project concluded three regional challenges: (Erhvershus Sjælland, 2022)

- Few innovative & growth-oriented (new) companies
- Weak technological development and weak commercial development via clusters
- Weak/slow digitalization in SMEs

The new FBI project addresses all three challenges. The project is led by Erhvervshus Sjælland (ES) and is supported by economic and network partners. The preliminary FBI project research came up with three main sectors to focus on: Smart construction, marine/maritime and food/biotech. Within the project there are four sub-goals: (Erhvershus Sjælland, 2022)

1. (Project leadership)
2. Bringing the innovation process forward in SMEs
3. Establishing cross-border collaborations between SMEs and students
4. Developing cross-border networks

This project focuses on the fourth sub-goal of the FBI project; developing cross-border networks. The next section of this chapter discusses the contents of the fourth sub-goal and introduces the problem area in which the project group focuses its research.

1.1 Problem area

The Interreg organization has provided a great steppingstone for innovation, progress, and growth in previous projects of establishing connections within different regions. One of the key points of the project is to create networks of SMEs and cluster organizations in the Fehmarn Belt region. A network that can hopefully boost economic growth in the region.

Introduction to the problem

A problem that we are going to be working on is how ES can create an anchoring effect to let the network live on after the project ends in 2026. How does the FBI project create a sustainable network that is anchored within the existing SMEs and cluster organizations and connects the regions of Schleswig-Holstein in Germany and the region of Zealand in Denmark? Is it possible to reliably anchor such a cross-border network after the project lifetime?

Focusing on the maritime sector

The research focuses on one of the sectors defined by ES. The marine and maritime (MM) sector focuses on digitalization, sustainability, monitoring, production, and marine nutrients in the project. Roskilde University's Center for Maritime and Marine research is an economic partner of the FBI project and takes a key role in strengthening the connection between the German and Danish organizations.

This decision was made regarding the availability of empirical data. The authors of this research paper have access to the project leader, and the economic and network partners in the MM sector. Furthermore, there is a network in the MM sector in the Baltic Sea region, the SUBMARINER network, which can provide insight into an existing case.

Scientific discussion

The terminology plays an important role in this research paper. The FBI project is talking about developing cross-border networks. The term ‘network’ is widely used yet not clearly defined. The first part of the scientific discussion focuses on differentiating between terms like ‘regional innovation systems’, ‘clusters’ and ‘networks’. Having clearly defined terms is important for the further development of this research paper.

Two main topics need to be researched to reach the fourth sub-goal; developing cross-border networks and anchoring said network. These topics point us in the direction of network creation and network sustainability in academic research. This includes predefined requisites and challenges of cross-border networks. The problem area is further situated in the discussion about network management and the development of a newly established network to a mature network.

The conclusion of the problem area leads to the following research question:

1.2 Research question

> *“How can the cross-border network existing of SMEs and cluster organizations in the marine & maritime sector in the Fehmarn Belt region be sustainably anchored after the Fehmarn Belt Innovation project has ended in 2026?”*

1.3 Delimitation

One delimitation of this research paper is the narrow focus on one of the focus sectors of the FBI project. The focus sectors of smart construction and food/biotech are disregarded. Therefore, the research done, and the conclusions drawn are very limited. Another delimitation is the duration of the research. The FBI project is conducted over three years and began in April 2023. This research paper is written during the start of the project and is therefore only able to encapsule the first few months of the project. A lot can change in three years that is not reflected in the findings of this paper.

2.0 Literature review

The literature review starts with a review of existing literature of regional innovation systems, clusters, network, and network management. Furthermore, the cross-border aspect is reviewed. Lastly, a knowledge gap and sub-questions for the research question are identified.

Innovation systems, national innovation systems and regional innovation systems

Innovation systems (IS), national innovation systems (NIS) and regional innovation systems (RIS) derive from the same theory. The only difference between the terms is the geographical origin. IS can be regional, national or global while NIS operates in a national context and RIS in a regional context. (Lundquist & Trippl, 2013; Trippl, 2006)

Trippl (2006, p. 2) mentions that the traditional Schumpeterian view of isolated innovation inside firms and other theories, such as the linear innovation model, are challenged by the systems of innovation approach as the systemic view on innovation becomes more and more relevant. Etzkowitz and Leydesdoff (2000, as cited in Asheim & Coenen, 2005, p. 1179): „The concept of IS can be understood in a narrow sense. A narrow definition of the innovation system primarily incorporates the R&D functions of universities, public and private research institutes and corporations, reflecting a top-down model of innovation as exemplified by the triple helix approach“ The concept of NIS was introduced by Freeman and Lundvall (1986, 1992; 1987, as cited in Autio, 1998, p. 132) “Lundvall gives no clear-cut definition for the concept of NSI, even though his book focuses on them. Freeman, on the other hand, gives a definition, defining NSIs as: "[...] the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify, and diffuse new technologies [...]". National systems of innovation (NSI) and NIS fall under the same definition.

(Autio, 1998, p. 135; Cooke et al., 1998) talk about regional systems of innovation or RIS that relate to the pre-existing national system of innovation or NIS. Doloreux and Parto (2004) state that there is no universal definition for RIS. Contrarily, they mention that a RIS “usually is understood as a set of interacting private and public interests, formal institutions and other organizations that function according to organizational and institutional arrangements and

relationships conductive to the generation, use and dissemination of knowledge." Trippl (2006) identify five elements of the RIS:

1. *Knowledge generation and diffusion subsystem:* The knowledge infrastructure dimension of a RIS. Organizations that produce knowledge, skills, and expertise.
2. *Knowledge application and exploitation subsystem:* This section refers to the industry, companies, and businesses.
3. *Regional policy subsystem:* This refers to the public authority.
4. *Local interaction:* Different relationships between each of the dimensions mentioned above. These different relations are very important for RIS.
5. *Socio-institutional factors:* The social norms play a part where the RIS is formed. Rules, regulations, behavior, values, and attitude towards innovation.

As mentioned in Trippl (2006), RIS conceptualizes a framework that is composed of clusters and networks within. Therefore, the next part of the literature review focuses on reviewing the existing literature about clusters and networks with the aim of defining these terms and establishing the relevance for the research paper.

Clusters

Porter first discusses clusters in the late 1990s. He calls clusters "critical masses of unusual competitive success in particular fields" (Porter, 1998, p. 78). He describes clusters as a concentration of interconnected companies and institutions that operate in a similar field, including governmental and educational institutions. Competition plays a big role in Porter's understanding of clusters. Competition is affected in three ways by clusters: First, clusters increase the productivity of the members in the cluster; second, clusters drive innovation; third, clusters encourage the formation of new businesses. Clusters are not developed overnight; according to Porter (1998) they take over a decade to fully develop. Porter (1998) also argues that if clusters are developed successfully, the organizations within the cluster simultaneously compete and collaborate with the other organizations within the cluster. This is possible because competition and collaboration happen on two levels of interaction and business. (Porter, 1998)

Networks

The definition of a network is very broad. Leick (2011, p. 167) writes that „networks offer competitive advantage through a reduction of transaction costs, risk-sharing or enhanced knowledge creation/transfer among participating firms“. This means that working in a network can be somewhat beneficial for the participants. But what is a network? Koppenjan and Klijn (2004, as cited in Edelenbos et al., 2013, p. 133) showed that the „The network concept is often used to describe public policymaking and implementation through a web of relationships between government, business and civil society actors". Federov (2013, p. 10) states that the concept of „network projects“ that brings together several research centers is broadly used in scientific circles. Klijn (2005, p. 329) further elaborates that „Networks can roughly be defined as 'more or less stable patterns of social relations between mutual dependent actors, which form around policy programs and/or a cluster of means and which are formed, maintained and changed through series of games' " According to Podolny & Page (1998) there are three types of organizations; hierarchies, markets, and networks. "Network forms of organizations foster learning because they preserve greater diversity of search routines than hierarchies and they convey richer, more complex information than the market (Podolny & Page, 1998, p. 62). A result from Leick (2011, p. 178) states „network-type relationships between more than two firms are clearly beneficial for achieving co-operative success in terms of cost reductions and revenue increase by entering new export markets or facilitating market entries ".

Differentiating between clusters and networks

When comparing the concepts of clusters and networks, it is apparent that they are connected. They are both cooperations / collaborations of business organizations, policy makers and knowledge institutions. The outcome of these relationships is motivated by a goal of mutual gains. Sroka, & Hittmár, S. (2015, p. 106) states that "Clusters are networks which concentrate autonomous entities representing different environments which, based on the principles of coopetition, create new value and fulfil the needs of numerous stakeholders."

Network management

The existing literature exclusively uses the term ‘network management’ and thereby discusses how these networks are managed and what duties a network manager has. Edelenbos et al. (2013, p. 133) describes the duties of a network manager as such: „A network manager brings people together and focuses on enabling interactions and relationship building in order to develop and explore content, and attempts to agree on sharing resources and joint content.“ Klijn’s (2005) definition of networks as mentioned above is in line with our understanding of networks. Therefore, this research paper is using Klijn’s approach to network management to ensure a coherent use of the terminology. Klijn (2005) elaborates by pointing out that all literature on network managers stress that a single central authority, a hierarchical ordering, and a single organizational goal does not exist. To be an effective network manager, the manager must have a combination of leadership, communication and facilitation skills. In addition, the manager must be able to build trust among network actors, manage conflicts, and ensure that the network remains focused on its goals. Finally, he says, “Since cooperation and the coordination of goals and interests do not occur spontaneously, it is necessary to steer interactions in policy games within networks. The (implicit) assumption is that a satisfactory outcome is often impossible without network management” (Klijn, 2005, p. 332). As a result, Klijn (2005, p. 331) poses the question “why engage in network management at all?” of which he answers with the following statement: “because society has become increasingly complex; problems demand solutions which require the resources of various actors, and in this situation classical top-down steering is not very helpful or is at least insufficient”. Edelenbos et al. (2013, p. 153) study concludes that „network management is an important factor influencing the evolution and the outcomes of governance networks“.

Cross-border cluster: Terminology, formation and strategy

If we move on from the general discussion of RIS, clusters and networks and their defining factors and focus on cross-border we come across many terms used to describe internationally organized clusters, such as ‘cross-border cluster’, ‘trans-border cluster’, bi-national cluster’ and ‘transnational cluster’. However, there is a lack of common understanding of these definitions (Mikhaylov, 2013a). Moreover, how the clusters are set up often describes the difference between terms. “The international cluster can be defined as a network of sustainable interactions […], which are localized in the territories of the two or more countries”

(Mikhaylov, 2013b, p. 2). The definition states that an international cluster is localized anywhere in at least two countries. Meanwhile, a bi-national cluster must be localized in at least two neighboring countries. Some authors use transnational clusters the same way as international clusters, while others use it the same way as bi-national clusters. The difference to a cross-border or trans-border cluster (sometimes mentioned as a transboundary cluster) is then that these cluster members need to be located in the border region of two neighboring countries compared to anywhere in the country as the following examples of definitions show: "Cross-border cluster is defined as a form of international cluster, which is characterized by the spatial localization within the border regions of neighboring countries" (Mikhaylov, 2013a, p. 3) and "Cross-border cluster is […] localized in border territories of neighboring countries" (Mikhaylov, 2013c, p. 1734).

Trippl (2006) explored whether the theoretical approach of a RIS could be applied to a cross-border setting. A case study between the regions of Baden and Alsace made by Koschatzky (2000) shows that language barriers, cultural differences and administrative complexities can be significant challenges in cross-border cooperation and knowledge transfer.

The existing literature discussing cross-border clusters is often case studies and empirical studies or comparative analyses of existing cross-border clusters worldwide. These studies aim to validate or check existing theories or create new theories about the development and requisites of cross-border clusters.

Mikhaylov (2013b) begins by describing the shift in cluster concepts and the change of assumption that not geographic proximity, but rather organizational proximity (shared values) is the key feature of a cluster. He also argues that co-opetition (cooperation and competition) happens based on contribution to the value process and not purely industry affiliation (Mikhaylov, 2013b). Zashev (2012) elaborates that cluster policies have an important role. Policy makers use clusters to develop an economic region. Border regions are usually less developed, and cross-border clusters are seen as a way to combat that. These clusters must focus on the competitive advantage of these regions. (Zashev, 2012)

Zashev (2012) and Mikhaylov (2013a) both discuss the formation and development phase of cross-border clusters and draw up factors that lead to a successful and sustainable cluster. Case research on these factors has led to the development of the 'triple helix' model. Mikhaylov (2013c), however, argues that the 'triple helix' model takes on a special form when applied to cross-border clusters. Since there are helixes on each side of the border, the helix is being

doubled, leading to the ‘doubled triple helix’. The system is so complex because all participants are interconnected, and the sustainable development of the cluster is defined by its ability to transform continuously. (Mikhaylov, 2013c) These cluster development theories and the ‘doubled triple helix’ theory are described in Chapter 3.0, ‘Theoretical framework’.

Most existing research about cross-border clusters uses the Baltic Sea region as a study case. The Baltic Sea region is one of the regions with the most cross-border activities and, therefore, the best ground to conduct such studies. This is due to longstanding history of strategic cooperation from the smallest to the biggest scale, the biggest being the EU-funded cooperation projects that have been driving international cooperation for a long time. (Mikhaylov & Bolychev, 2015)

Cross-border clusters in the Baltic Sea region

As mentioned in the section about cross-border clusters above, the Baltic Sea region is one of the most discussed regions in the existing literature, these include Federov (2013), Mikhaylov (2013a), Zashev (2012), Yndigegn (2011), Perkmann (2003) and Mikhaylov & Bolychev (2015).

These existing clusters in this region are mostly analyzed through case studies. One of the most prominent clusters in the Baltic Sea region is the Medicon Valley cluster. Mikhaylov (2013b) and Yndignen (2011) both discuss the specific case of the cluster Medicon Valley, which is located in the Öresund region (Sweden and Denmark). Yndigegn (2011) discusses in their paper the concept of “debordering” in Europe through cross-border cooperation and uses the Öresund region and the Medicon Valley cluster as an example. The cluster management organization came to be in 1995 before becoming an EU-funded project in 1996. After three project years, it has continued as a cluster with almost 300 members. (Yndigegn, 2011) The results of the case study by Mikhaylov (2013b) show that certain internal rules and regulations are in place. The strategy of the Öresund cluster focuses on the micro-specialization of individual cluster members. The core of the cluster, a strong player, takes over managerial and coordination tasks. With an increasing number of cluster members, the cluster transforms. The two reasons the article mentions are the increased diversity of the actors and their micro-specialization and the toughening of the global competition. (Mikhaylov, 2013b)

Our research focuses on the FBI project based in Germany and Denmark. This region belongs to the Baltic Sea region but there are specifics regarding any country. Mikhaylov (2013a) mentions that the Ministry of Science, Technology, and Innovation (MSTI) is the key player in forming a cluster in Denmark. In Germany, the states (Länder) develop programs as they are rather independent. Mikhaylov argues that Germany and the Scandinavian countries show a high number of stable international clusters due to the favorable conditions: high levels of economic development, great innovative potential and coherent cluster policies/programs that focus on innovation. (Mikhaylov, 2013a) Clusters in the region of Jutland, where the Interreg project is located, are mentioned as an example of cross-border clusters (Mikhaylov, 2013a).

Knowledge gap

The literature review starts broadly with the introduction of IS, NIS and RIS and continues with Porter's discussion of clusters and term discussions of networks, and network management. It becomes narrower through the cross-border aspect. The focus of our research lies in the Baltic Sea region, specifically the border region of Germany and Denmark. The literature often discusses formation and requisites and potential challenges of cross-border clusters. The existing literature does not discuss very elaborately the structural transformation a cluster undergoes to become a mature cluster. Furthermore, we are interested in investigating what happens when the driving force behind the development of the cluster falls away. What happens if this force does not exist anymore? How does a cluster continue to exist or in other words, how can a cross-border cluster be anchored?

Out of these reflections we can form the following sub-questions to our research question:

> *"How can the cross-border network existing of SMEs and cluster organizations in the marine & maritime sector in the Fehmarn Belt region (Germany and Denmark) be sustainably anchored after the Fehmarn Belt Innovation project has ended in 2026?"*

1. **How do the different understandings of RIS, clusters and networks emerge in the FBI project?**

The FBI project is using the term 'network' in their fourth sub-goal. Therefore, the literature and the understanding of the FBI project about networks is analyzed. This sub-question aims to define the different terms in the context of the FBI project and to give a suggestion on what to call it.

2. **In which way are the requisites and challenges to develop a sustainable cross-border network present in the project partners' understanding of the FBI project?**

This sub-question compares the findings of the literature review with the empirical research about the FBI project to judge the efforts made in developing a cross-border network.

These sub-questions aim to answer our main research question by guiding the analysis and giving the necessary insight to draw up a conclusion.

3.0 Theoretical frameworks

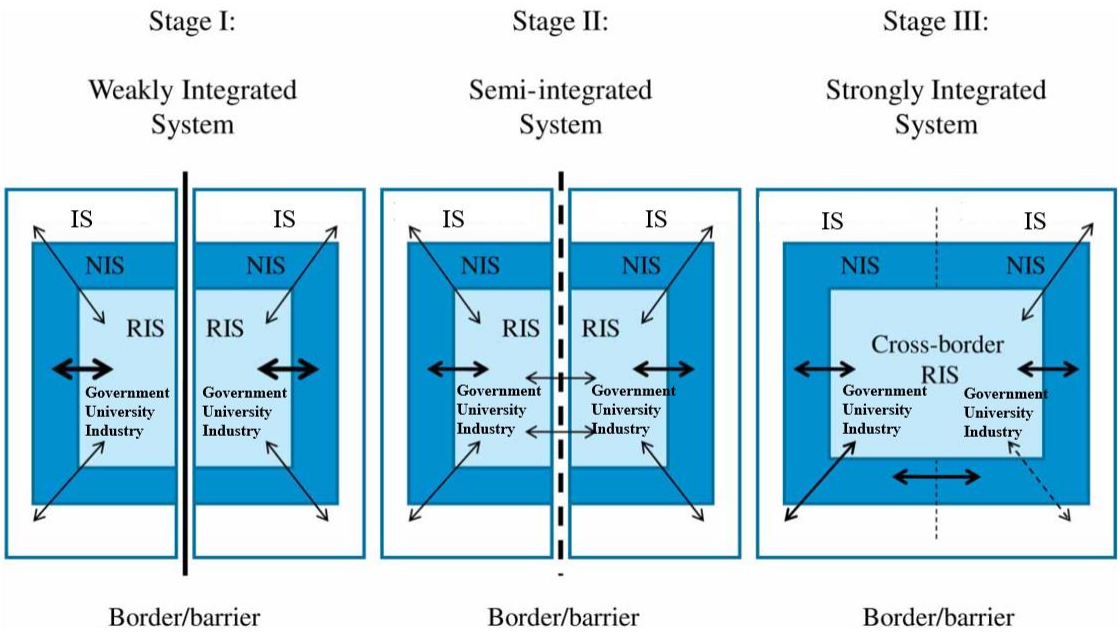
This chapter describes the theories and concepts mentioned in the literature review (see Chapter 2.0, 'Literature review') that are relevant to our research. The chapter starts by introducing the theory about the different stages of integration a cross-border RIS can have. To sustainably anchor a cross-border cluster, it needs to be developed first. The development of a network is often described in the literature using certain steps and factors. These are further elaborated in this chapter. Furthermore, a network can be evaluated by testing requisites and potential challenges using the model of the doubled triple helix. Finally, the stages of a cluster can give insight into the level the cluster is at and could be based on systematic interactions. Following these steps and guidelines, anchoring the cluster comes naturally due to the maximization of met requisites and the minimization of potential challenges.

Stages of a cross-border regional innovation systems

This segment of the theoretical framework aims to show the different stages a cross-border RIS could be integrated in and to enumerate the describing characteristics of said stages.

Lundquist & Trippl (2013) have devised multiple RIS dimensions that characterize cross-border RIS integration. Figure 1 below shows the three stages of this integration.

Figure 1: Stages of cross-border integration.



Source: Own production inspired by (Lundquist & Trippl, 2013).

The figure shows that while the RIS is the focal point of the observation, the cross-border RIS's interactions between the NIS and the whole IS should also be taken into consideration. The RIS, which desires to be integrated, has the governmental side in form of active policy support, the university side in forms of knowledge institutions and the industry side with the business organizations and clusters participating in the system. Based on the work of Lundquist & Trippl (2013) the characteristics of the different stages are the following: (Lundquist & Trippl, 2013)

- Economic structure/specialization pattern, referring to the differences, or alternatively, synergies between the affected business areas.
- Science base/ knowledge infrastructure, referring to the differences in specialization of scientific fields, where Stage III would be having complementarities between said fields.
- Nature of linkages, indicating the level of knowledge exchange.
- Institutional set-up, which refers to the institutional distance. Stage III represents low levels of this distance which means a high tendency to create common innovation.
- Policy structures, referring to the governmental support for the cross-border RIS. While Stage I of the integration would show asymmetrical support between the two governments, Stage III would have symmetrical and transparent support from the governments.

- Accessibility, indicating the physical proximity of the actors inside the cross-border RIS. It can be improved by enhancing the connecting infrastructure between the countries.

The doubled triple helix model

Figure 2: Triple Helix.

Source: Own production inspired by Mikhaylov (2013c).

The most significant factors are industry cooperation, interactions of government authorities and cooperation in educational and R&D sectors, in short, three main institutional helixes: business organizations, policy makers and knowledge institutions (see figure 2). This symbolizes the triple helix model, "a tool for formation of innovation clusters" (Mikhaylov, 2013c, p. 1734). When applied to a cross-border model, the model includes helixes of two independent countries and is therefore doubled in form. Each helix develops on its own over time, transforming the whole system (cross-border cluster). There are three main reasons for such a transformation. First is instability within the cluster due to a changing number of participants and a changing structure within the helixes. Second, interchangeable roles of the participants and third, a change of strategic focus of the main participants. The system can be stable on one side and uncertain on the other due to similarities and differences in the countries that are part of the cross-border cluster. These similarities and differences include factors like culture, legislation, and infrastructure. The 'doubled triple helix' consists of linkages and interactions between all participants, further developing the whole cross-border cluster, making the system so complex. The development of the cross-border cluster also depends on the ability to transform continuously. Within the helixes there is a constant pursuit for integration and differentiation. Universities and industries are urged to micro-specialize while governments want to balance integration and differentiation to preserve regional identity and sovereignty.

Cluster development theories

To have an existing and successful network, it needs to be formed and developed. Based on the research of Zashev (2012) there are four steps in cross-border cluster forming and development:

1. Viable market-based competitive edge, there needs to be an actual market demand,
2. Critical number and/or size of participants, the market opportunity must have the necessary resources in the background, meaning interested actors who participate,
3. Free information exchange between various stakeholders with common interests,
4. Cluster building, deepening the connections with I.e., subcontracting.

Cross-border can be an advantage for a cluster, giving access to more resources and market space. When developing a cluster, it is important to evaluate the market viability and their changes in general; therefore, it is crucial to identify industries with a competitive advantage on both sides. Furthermore, it is important to unite managers and entrepreneurs under common goals and communicate clearly to create a sense of belonging and network opportunities. This proves to be challenging. (Zashev, 2012)

Mikhaylov (2013b) concludes that three factors lead to the formation and sustainable development of a successful international cluster (Mikhaylov, 2013b):

1. "a sufficient level of scientific, technological, and innovative development in the participating countries;
2. active public support for stimulating the creation of innovative clusters and their internationalization;
3. the implementation of cluster support programs at national and supranational levels."

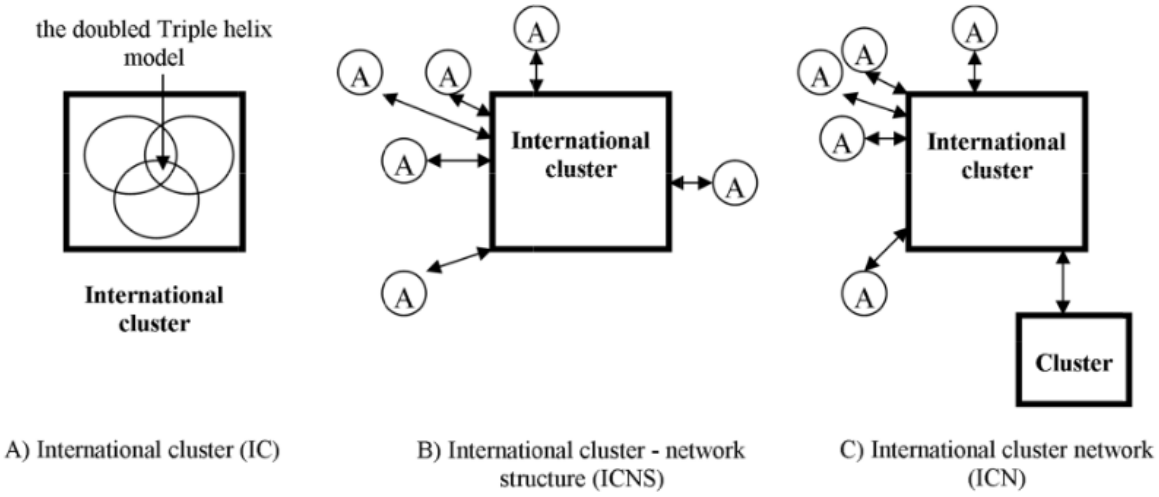
Mikhaylov (2013b) further elaborates on the formation of an international cluster network, which is further described in the last part of this chapter:

> *"The formation of the international cluster network is based on the following objectives: 1) co-innovation activities with regard to the exchange of knowledge, skills and know-how to achieve synergy effect and innovation diffusion; 2) the promotion of domestic commercialization of high-tech innovation; 3) strengthening the clustering effect among existing and potential cluster actors in order to increase the level of innovation development and competitiveness of the macro-region in the global market; 4) the desire to initiate joint R&D as to explore the best practices for a successful implementation of innovative solutions; 5) strengthening of the regional innovation systems and the optimization of resources, infrastructure and supporting services"* (A. Mikhaylov, 2013a, p. 7).

Structural transformation of an international cluster

An international cluster undergoes three stages of structural transformation in its development process (see Figure 3). A cross-border cluster, by definition (see Chapter 2.0 ‘Literature review’), falls under the term international cluster (IC) and represents the first stage of the transformation (1A). The cross-border cluster is based on the doubled triple helix model. To develop from an IC to an international cluster-network structure (ICNS) (1B), the cluster interacts with different actors on a permanent basis. These actors are not members of the cluster itself. The ICNS acts as a transitional phase between the IC and the international cluster network (ICN) (1C). This development is possible by forming international cluster alliances. The arrows in the illustration represent interactions between cluster and actors. Structural transformation is an aspiration to expand interactions. The ICN allows clusters of different sectors to merge to improve efficiency and innovate in the overall system through common objectives, technology, strategic planning and market positioning. According to the author, an IC can be in more than one stage simultaneously depending on the scope of the study (Mikhaylov, 2013a)

Figure 3: Systems of the international cluster interactions

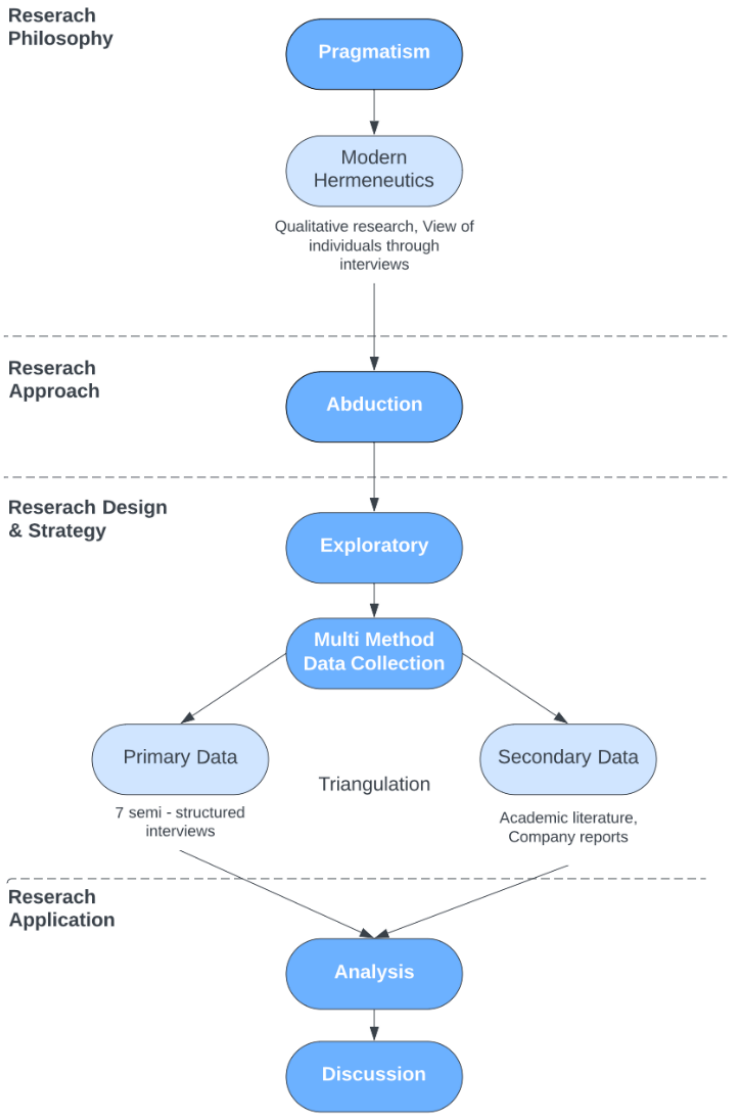


Source: (Mikhaylov, 2013a, p. 6)

4.0 Methodology

In this section, we introduce the methodology behind this paper's research and philosophy of science. This chapter includes the investigation of the study and its philosophical assumptions and acts as a guidebook on how the research is carried out.

Figure 4: Research Structure Overview



Source: Own Production

4.1 Research philosophy

The first part of the illustration and, therefore, the first part of this chapter, discusses our chosen ontology and epistemology. Ontology is the theory of the nature of reality, which answers the question of how we understand the world. On the other hand, epistemology is the theory of knowledge and therefore answers how we know the world (Delanty & Strydom, 2003).

Ontology: Pragmatism

For this project, we have chosen pragmatism as our ontological viewpoint, because, throughout the project process, there are multiple perspectives that the researcher must consider. Through pragmatism, we do not necessarily have to choose only one perspective or direction; if we choose one, it does not exclude the possibility of other perspectives / directions. Furthermore, "Pragmatism aims to explore how specific individuals act in tangible situations" (Egholm, 2014, p. 168). Through interviews, we use pragmatism to explore how a tangible situation in developing networks may commence. However, there do not need to be certain conditions to be applied in order for us to work with pragmatism as ontology. (Egholm, 2014, p.168).

Epistemology: Modern Hermeneutics

Hermeneutics works with the understanding of the objects that are being researched and the interpretation of them (Egholm, 2014, p. 88). Hermeneutics is considered to work with hidden meanings in texts (Egholm, 2014, p. 88). This is very different from i.e., positivism, which attempts to explain phenomena in natural sciences through prior knowledge (Egholm, 2014, p. 75). Hermeneutics deals with social sciences, including the researchers' angle of entry into the subject (Egholm, 2014, p. 91). According to Egholm, the researcher will have some degree of bias and pre-conception of that which is dealt with, and opposite to positivism, this is welcomed, for it is simply not possible to divert from bias (Egholm, 2014, p. 91). Hermeneutics must also consider the cultural differences of the social sciences, it cannot cross cultural boundaries and understand different cultures, due to interpretation being culturally specific (Delanty, 2005, p. 46). This idea of welcoming pre-conception is of the philosopher Hans-Georg Gadamer, he has been working with that in modern hermeneutics (Delanty, 2005, p. 46), which to the researchers of this paper, is regarded as well-fitting in the case of the FBI project.

Modern hermeneutics is also concerned with the hermeneutic circle, meaning a 'bubble' of knowledge around what is being researched is present (Holm, 2013, p. 90). Modern hermeneutics fits well with our pragmatist ontological viewpoint as it works with both verbal and non-verbal communication. Through pragmatism the researcher can use both to whatever extent found necessary.

Understanding the hermeneutical circle, Gadamer talks about how one might enter this "realm" of knowledge; we seek to understand something, but we must understand the whole to understand anything, however, we must understand parts before we can understand the whole (Holm, 2013, p. 87). Gadamer considers multiple ways of how to enter this circle. Either the researcher must use the comparative or divinatory methods prescribed with classical hermeneutics, or the researcher shall just assume to be part of the realm of knowledge, which is the circle itself (Holm, 2013, p. 87). The latter can be assumed due to the interest of the researchers and the field of research merging (Holm, 2013, p. 87). Concerning the FBI project, the case there-in is network management, sustainability, and cross-border operations, which the researchers find very relevant and of big interest, which opt for the usage of the divinatory method.

Using modern hermeneutics, the study of the FBI project may provide deeper insight into how the project leader (ES) and the project partners see the project, how a cross-border network can be constructed, and how it can be sustained. All of this is at a more qualitative level, thus providing a more in-depth review of the process. In contrast, positivism would somewhat disregard the opinions of the stakeholders interviewed and rather work with 'yes' or 'no' answers to surveys, and rely on numbers from quantitative data gathering methods, which is not considered well-fitting for this project. Modern hermeneutics enables the researchers to interpret the findings through literature, interviews, and analysis, thus combining it into meaningful knowledge based on the best possible attempt at explanation and prediction.

The main implications for using modern hermeneutics for this project may be the cultural boundaries and the difficulty of understanding "alien" cultures for interpretation. Another implication is the understanding of the theories presented. The existing research on 'cross-border clusters' and 'network management' struggles to find consensus on the definition of these concepts. Modern hermeneutics provides the tools to look at the theories through different understandings. Furthermore, if the data set is large, meaning if it proves to be quantitative, the

hermeneutical perspective may lose the advantage of using social science rather than natural sciences through positivism.

4.2 Research approach

Abduction

Abductive reasoning attempts to make the best possible prediction instead of a general conclusion (Saunders et al., 2015). It is related to the discovery of theory. Peirce argues: “Abduction is the process of forming explanatory hypotheses. It is the only logical operation which introduces any new idea” (Mohammadian, 2019, p. 141; Saunders et al., 2015) It is related to the discovery of theory. Peirce argues: “Abduction is the process of forming explanatory hypotheses. It is the only logical operation which introduces any new idea” (Mohammadian, 2019, p. 141). “Abduction heralds a new way of working, in which it is possible to identify an unknown object whose being cannot be proved, but it is possible” (Egholm, 2014, p. 173). Abduction may take incomplete observations and provide a result with the best possible prediction, thus saying it may be true (Saunders et al., 2015). The abductive reasoning seeks to establish the best possible explanation for a problem. We value this approach to research as it acknowledges that the answer to the problem may not be of 100 % certainty; thus, it does not exclude other answers, which is well in line with the pragmatic ontological viewpoint. Furthermore, this fits with our epistemological viewpoint in the way that we interpret our findings. This does not exclude other interpretations; it just means we did not make that interpretation.

4.3 Research design & strategy

Exploratory

We seek to explore what it takes to create and sustain a cross-border network. Therefore, the research design and strategy can be exploratory as new elements may arise or show themselves during interviews. This strategy will allow the researcher to dive further into the unknown of not necessarily available theoretical knowledge on the subject. Furthermore, the exploratory

setting fits well with the semi-structured interviewing type, which will be the main empirical data-gathering technique. (Kuada, 2012, p. 102)

Multi-method data collection

Secondary data: existing literature

The secondary data consists of the existing literature in the field of clusters and networks. This paper uses secondary data to conduct a literature review.

The FBI project is still in the starting phase. While the aims of the project have been worked out, there are still changes possible due to the course of the project. Therefore, our research focuses on the starting phase of a cluster, the development theories and the factors that need to be in place to establish a cluster. Our context in this research is the development of a cluster. The literature review was conducted over multiple weeks where we searched for relevant texts in the field of 'cross-border clusters' and 'network management'. The research was mostly conducted through the online search option of the university library and through the usage of reference lists of found articles. One of the earliest findings was an existing literature review of 'cross-border clusters' and 'regional innovation systems' in the Baltic Sea. This academic paper guided us towards the theories described in Chapter 3.0, 'Theoretical Framework'. The articles chosen for this research paper hold value through discussions and case studies of the terminology and the discussion of case studies done with cross-border clusters in the Baltic Sea. Through conversations with the interviewees, we received more input for our research. One interviewee mentioned the beginning of the cluster theory of Porter while another mentioned the EU policies about clusters and networks. To focus our research more, we limited our search results on Germany and Denmark. This way the literature review evolved throughout the project.

Primary data: semi structured interviews

Interviews can give insight into the relationship between different agents in a social network and to understand what patterns and why patterns exist (Dooley & Lichtenstein, 2008). To conduct relevant data collection through an interview, we recognize the qualitative and semi-structured approach to gain in-sight that is descriptive, in-depth, vivid and able to allow the

emergence of conceptualization (Kallio et al., 2016). As a point of entry to the field of sense-making it is also appropriate with this approach, as it encourages answers that reflect participants' feelings and stories, perceptions and experiences (Kallio et al., 2016). According to Kallio et al. (2016)'s review of the literature on semi-structured qualitative interview methodology, this approach is designed with a list of questions that directs the conversation while it remains loose enough to allow dialogue and flexibility towards this dialogue. This is done by well-formulated questions that are; participant orientated, not leading, clearly worded, single-faceted and open-ended. An approach to direct answers to be descriptive is encouraging questions of; what, who, where, when, and how (and maybe also why). (Kallio et al., 2016) On a structural level the design is based on main theme questions and follow up-questions (Kallio et al., 2016). Main themes function as structural guidelines and follow-ups direct toward specific study subjects. Practically, follow-ups can be pre-designed or spontaneous to follow an appearing interest, but main themes should be pre-designed and fixed to ensure a well-developed structure is kept throughout the interview. Using semi-structured interviews works well with modern hermeneutics as it helps the researcher understand the perspectives of different actors as mentioned in the description of hermeneutics. Furthermore, the ontology of pragmatism allows the researchers to use different viewpoints made in the semi-structured interviews.

We conducted seven semi-structured interviews with ES project partners and with important players in an existing network within the MM field: Erhvervshus Sjælland, SUBMARINER network, Kieler Wirtschaftsförderung, RUC Center for Maritime and Marine Research, TransMarTech, Danske Maritime and Maritime Cluster Norddeutschland. We conducted interviews with all financial and project partners in the focus sector of MM as well as the project leader, ES, themselves. The partners were selected based on their involvement in the FBI project. Furthermore, we conducted an interview with an existing network in the MM sector in the Baltic Sea region to gain insight into a successful network within the sector and the region. The interviews were held online and lasted between 30-60 min. Each interview was transcribed word for word and coded using the same method for all seven interviews (see Appendix A). Each paragraph was summarized using a few words or a short sentence as dimensions. Afterwards, these 'codes' were all collected in an excel sheet (see Appendix B) and categorized based on interview themes and sub-questions. The following table 1 gives an overview of how the coding categories are set up.

Table 1: Coding of the interviews.

Core-category	Categories	Sub-categories	Dimensions	Illustrative Examples
Research question	Sub-questions	Interview themes	Codes from the transcripts	Direct quotes

Source: Own Production.

The results from the interview are kept anonymous. In this paper, the interviews are referred to as; PPI#X (yyyy, d mm) Interview Project Partner X and the coding of the interviews is referred to as; PPIC#X (yyyy, mm) Coding of interview of Project Partner X.

Triangulation

As mentioned in the section about the secondary research, the interviews and the literature review were conducted partly simultaneously. The initial literature search and the first readings helped us develop the outline of the interviews and ask specific questions. We sought out the interview with ES as the leader first, to understand if the project leader's thought of the process was reciprocated by the network partners at this point. Following this we got permission to contact several network partners via email, from this we set up interviews with the project partners that responded in the order that their time schedule permitted. The interview questions developed over time and were adjusted based on the interview partner and what we had learned by looking more into the existing research. Therefore, the primary and secondary data build on each other and are connected through the research process. This relates back to the usage of abduction as a research approach. Going back and forth between the primary and the secondary data gives the researcher the chance to find the best possible explanation of the research question.

5.0 Analysis

The chapter is structured in two parts that coordinate with the two sub-questions mentioned in the literature review to answer our research question.

5.1 Sub-question 1

"How do the different understandings of RIS, clusters and networks emerge in the FBI project?"

First, we are looking at how the FBI project relates to the framework of RIS and second, we are looking at the terminology findings about cluster and networks. With this part of the analysis, we want to be able to answer the question of which terminology is best used in the case of the FBI project.

How the FBI project is related to the framework of RIS

A RIS is a framework that includes clusters, networks and various other actors and institutions within a geographic area. These actors interact, create and transfer knowledge. A RIS involves policy makers, business organizations and knowledge institutions that collaborate and share resources to foster innovation and economic growth. And as elaborated in the literature review, a RIS can be cross-border. The first part of this sub-question looks at how the FBI project is related to RIS and how the potential cross-border network in the MM sector shows up in the framework.

The literature about RIS mentions the key elements of policy makers, business organizations, and knowledge institutions. Therefore, we can argue that the RIS is based on the triple helix model, and by logical conclusion, the cross-border RIS on the doubled triple helix model as described in the theoretical framework. The FBI project aims to develop a cross-border network within the MM sector. Clusters and networks are part of a RIS; therefore, a cross-border cluster is part of a cross-border RIS. Our understanding of RIS leads us to the conclusion that if a cross-border cluster is part of a cross-border RIS, the development of said cluster in turn also

develops the cross-border RIS. This understanding is further supported by the existence of the doubled triple helix in both a successful cross-border cluster and a strongly integrated cross-border RIS. The development of the different stages of a cross-border RIS, as described in Chapter 3.0, 'Theoretical framework', are therefore not individually reviewed but are believed to be part of the development factors of a cross-border cluster.

Cluster vs. network – a discussion about terminology

The perceptions of what to call the FBI project as well as the usage of the terminology of clusters and networks differs between the partners that were interviewed. It is visible that a clear distinction is not made. One of the interviewees mentioned: "To be very honest, for me there is no difference between a cluster and a network" (PPIC#5, 2023, F:7). Some define networks to be looser than clusters, which are believed to have more structure and to be truer to a certain theme / focus, for example: "Clusters are formally organized entities that have a specific and quite well described role (PPIC#1, 2023, F:13)." According to one interviewee this can also lead to a certain degree of blindness to potential opportunities and therefore a network with a wider angle is preferred. Furthermore, a reason for either using 'cluster' or 'network' as a term are the local regulations and policies in Germany and Denmark and the EU in a wider frame. In Germany, the cluster policy is regulated on a federal (Länder) level (Federal Ministry for Economic Affairs and Climate Action, n.d.). The border region of Germany to Denmark is the state of Schleswig-Holstein, whose cluster policy defines clusters as "Clusters emerge primarily from the regional concentration of companies and other organizations that share a common field of activity and focus on a specific economic sector" (Landesportal Schleswig-Holstein, n.d.). The cluster policy in Denmark was created in cooperation with different ministries and regions in the country. The policy paper uses the wording 'enterprise cluster' and describes it this way: "the term 'enterprise cluster' is more often used to denote a group of enterprises that are in horizontal and vertical networks within a relatively limited local or regional area" (Ministry of Science, Innovation and Higher Education, 2013). The policy of the EU states the following: "Clusters are groups of firms, related economic actors, and institutions located near each other and with sufficient scale to develop specialized expertise, services, resources, suppliers and skills" (European Commission, n.d.).

The literature does not give us a clear definition either of clusters or networks as well as the difference of the two. The cross-border factor does not really play into the discussion. One difference that can be found is the narrow focus of the clusters on one industry while networks do not have such a constraint. Based on the interviews conducted, the project partners' understandings seem to come to the same conclusion of clusters being narrower. One project partner mentions that they believe clusters to be more regionally close than networks. "We could also call them cluster, as we are a region. It's cross-border but still it's a geographical area" (PPIC#3; 2023, F:18). Germany and Denmark are neighboring countries which allows any clusters that are present in the border regions of both countries to be named a cross-border cluster. The EU does not use the term cross-border cluster and does not list any existing examples of cross-border clusters (European Commission, n.d.). To move forward with the analysis of sub-question 2 about the requisites and challenges of a cluster or network, we need to define our understanding of the terms used.

An overview of the understandings of the terminology

Table 2 attempts to define the used terms in this research project based on the existing literature and the understanding of the project partners. The definitions cover all terms used in the literature review and theoretical framework that are relevant for further analysis and discussion. The different terms used in the literature review within the definition of IC are not mentioned here as they do not play a role in the FBI project. Furthermore, the terms of ICNS, ICN and network management are understood as they are defined in the literature (see Chapter 2.0, 'Literature review').

Table 2: Understanding of the different terms.

Term	Description
Regional innovation systems (RIS)	Regional innovations systems are a framework, in which policy makers, business organizations and knowledge institutions are interaction on a regional level.
Cross-border regional innovation systems	Cross-border regional innovation system uses the same understanding as regional innovation systems with the addition of cross-border; meaning "localized in border territories of neighboring countries".
Clusters	Clusters are a concentration of companies, governmental and educational institutions that operate in a shared field of activity within a specific economic sector and a limited regional area
International clusters	International clusters uses the same understanding as clusters with the addition of international; meaning "localized in the territories of the two or more countries".
Cross-border clusters	Cross-border clusters uses the same understanding as clusters with the addition of cross-border; meaning "localized in border territories of neighboring countries".
Networks	Networks are a web of social relationships between companies, governmental and education institutions that are dependent on each other.
Cross-border networks	Cross-border networks uses the same understanding as networks with the addition of cross-border; meaning "localized in border territories of neighboring countries".

Source: Own production.

Based on these understandings, it is visible that there is no significant difference between the terms ‘cluster’ and ‘network’. Given that the FBI project is developing relationships between companies, governmental and educational institutions in one specific industry, the MM sector, it could, by definition, be called a cluster. As mentioned in the introduction of this research paper, the fourth goal of the FBI project is to develop cross-border networks. Even though the term ‘cluster’ would be a more accurate description of the goal, using ‘network’ is also accurate and has several advantages. The term ‘network’ allows the FBI projects to be wider in their constellation of the network members. Furthermore, and most importantly, ‘network’ does not interfere with any regional or transregional cluster regulation or policy and is therefore advised to be used. Therefore, the following chapters of this research paper solely refer to the development and anchoring of cross-border networks instead of clusters with the content of the theories staying the same.

5.2 Sub-question 2

“In which way are the requisites and challenges to develop a sustainable cross-border network present in the project partners’ understanding of the FBI project?”

The second sub-question discusses the factors needed for the FBI project to reach its goal of developing a cross-border network.

Requisites for a successful network

The first part in answering the second sub-question are the requisites for developing a successful network. Based on the literature review and the theoretical framework, we are using the theories of the doubled triple helix model, the development factors as well as the systems of international cluster interactions.

The doubled triple helix model:

The idea in this part of the paper is to establish insight into whether there is a triple helix setup for the FBI project or not, both for the German and Danish sides of the border; thus, it would be a doubled triple helix approach.

1. Policy makers

Common for both the German and Danish sides of the border is that the project is supported and funded by the Interreg program. Interreg is one of the key instruments of the EU, which is a policy maker for both the Danish and German regions of the FBI project, as they are both members of the European Union. The involvement of the Danish government is an indirect connection, this is because the Danish government decided to implement six new business centers across Denmark and has funded them according to population size in each of the six regions (Erhvervsministeriet, 2018). The ability of ES to function as leader of the FBI project is in this way a result of the implementation of ES by the Danish government back in 2018, but neither the Danish government nor the region of Zealand are economic partners of the FBI project directly. The funding of the FBI project comes mainly from Interreg and some knowledge institutions on both sides of the border (Erhvershus Sjælland, 2022).

The German government is perhaps more far-fetched as an economic partner of the FBI project. The German knowledge institutions, which are economic partners of the FBI project, are financially supported by the "Länder" (states in Germany), which is financed in turn by the German government.

2. Businesses organizations

The FBI project has only just started, this means that the support based on the business side of the triple helix is limited in the way that the SMEs of the project have not yet been mapped out. Therefore, this part will take a standpoint in whom ES have already established contact with. These primarily exist of network / cluster organizations in both countries.

In Denmark there are currently 8 project partners (Erhvershus Sjælland, 2022). Since the scope of this paper is limited to the MM sector, we have only focused on project partner PPIC#6 and project partner PPIC#4. PPIC#6 has expressed interest in the FBI project from the perspective of their members as in advantages like more focus on cross-border affairs seems promising to them (PPIC#6, 2023, E:55). PPIC#4 joined the FBI project in an explorative and supportive matter (PPIC#4, 2023, E:74).

In Germany there are currently 5 project partners (Erhvershus Sjælland, 2022). Here we again only focused on the MM sector; project partner PPIC#5 and project partner PPIC#7. PPIC#5 sees the FBI project as a road to collaborative thinking, problem solving through network

building and a better / more nuanced working environment (PPIC#5, 2023, E:37, E:40, E:41 & E:42). Bringing together institutions and organizations with different expertise is important to them. PPIC#7 believes that joining and supporting a network like the FBI project is important due to insight gains, it being beneficial to SMEs in Germany and the thought that if they do not innovate, then someone else will (PPIC#7, 2023, E:57). Here innovation is seen as joining a network and taking part in the network when something in the industry is changing. They also believe that it will strengthen already existing networks. Moreover, the German led network by the name SUBMARINER network showed interest in the FBI project.

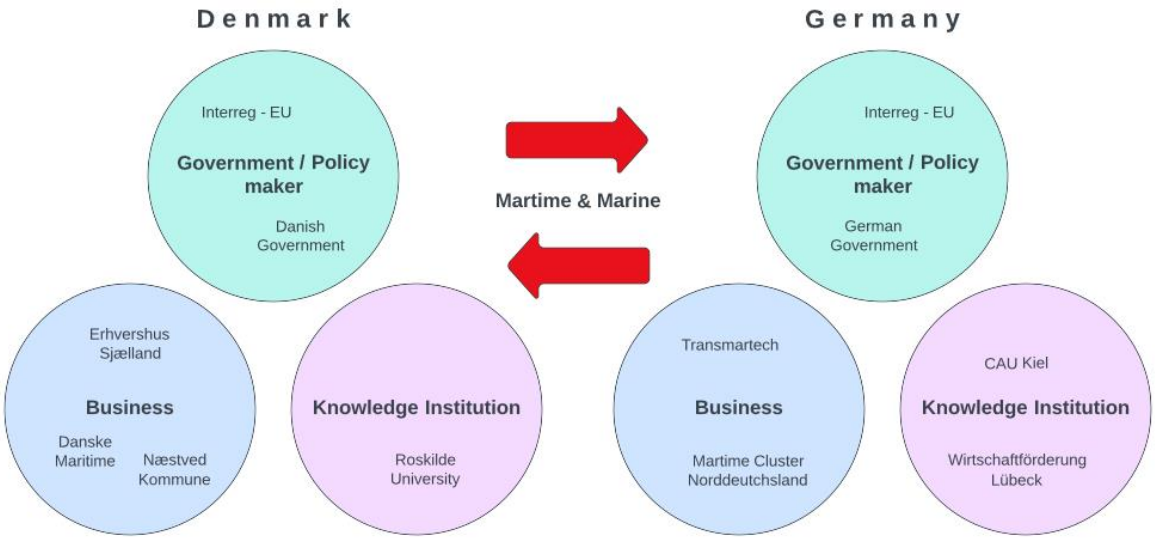
There are supportive actors and organizations both in Denmark and Germany who have joined the network for various reasons. Naturally, since they have all agreed to become network partners, they support the FBI project due to common interests and ambitions.

3. Knowledge institution

ES have established contacts with knowledge institutions in both Germany and Denmark for collaboration and connection in the Fehmarn Belt Region. They include: Technikzentrum Lübeck, Fachhochschule Kiel, Kieler Wirtschaftsförderung and Wirtschaftsförderung Lübeck for Germany. For Denmark: Centre for Maritime and Marine Research at RUC, Business Lolland Falster, Knowledge Hub Zealand, DTU Byg and SDU. The idea here is for students and stakeholders therein to take part in knowledge transfer, networking, research and development for the FBI project to prosper.

Through the above, we can see some support from the third and final part of the double triple helix. The model below will try and illustrate the connections and showcase the supportive functions towards the FBI project.

Figure 5: Doubled triple helix for the FBI project.



Source: Own production.

The policy makers influence on the FBI project is present through the funding and collaboration with the Interreg program. Although some of the knowledge institutions in the Danish and German regions are economic partners, it seems too distant to deem the Danish and German governments economic partners or drivers for the FBI project. Thus, the policy maker part of the triple helix is only somewhat apparent. The business side of the triple helix is evidently apparent and supportive of the FBI project, this is true on both sides of the border. Lastly, knowledge institutions have affiliation with ES in the project and can act as the third and final brick in the doubled triple helix setup.

Cluster development theories:

This section will take into consideration the various requisites of a successful network creation. It does so by looking at the points made by Zashev (2012) and Mikhaylov (2013a, b), furthermore comparing them, aligning them, and assuring they do not overlap. Moreover, it will compare them with the insight gained from the interviews. When looking at this section, it is important to note that the network is considered a product in itself, and not a product produced by one of the members of the network.

The table below summarizes the requisites and compares the literature and the primary data collection for this paper with each other to see if there is evidence of a consensus in each of the requisites.

Table 3: Cluster formation requisites

Requisites	Literature	Interviews
1. There needs to be a market demand. *(Product = Network)*	Zashev (2012)	PPIC#5 PPIC#6
2. Enough participants/organizations with resources. *(Within the Network)*	Zashev (2012) Mikhaylov (2013b)	PPIC#1 PPIC#5 PPIC#6 PPIC#7
3. Sharing of information. *(Within the Network)*	Zashev (2012) Mikhaylov (2013b)	PPIC#1 PPIC#3 PPIC#5
4. Building / adding to the network.	Zashev (2012)	PPIC#2 PPIC#5
5. Promotion of domestic products. *(Product = Network – Domestically in Denmark and Germany)*	Mikhaylov (2013b)	PPIC#5 PPIC#7
6. Joint R&D for innovation solutions. *(For members of the Network)*	Mikhaylov (2013b) Mikhaylov (2013a)	PPIC#6
7. Strengthen innovation, optimize resources, infrastructure and supporting services. *(For the Network)*	Mikhaylov (2013b)	PPIC#1 PPIC#5 PPIC#7
8. Active public support. *(Toward the Network)*	Mikhaylov (2013a)	PPIC#1
9. Implementation of network support programs. *(Like ES leading the project)*	Mikhaylov (2013a)	PPIC#1 PPIC#2 PPIC#3
10. Solutions need to be scalable for internationalization. *(Solutions based on work with the cluster and partners / SMEs)*	-	PPIC#1 PPIC#6
11. Communication. *(From and with the Network)*	-	PPIC#1 PPIC#3 PPIC#5 PPIC#6

Source: Own production

The literature has stated several important points which need to be considered for a newly developed network to thrive. Furthermore, the interviewees also added two important points (see table 3). In general, the interviewees have supported the points made in the literature with regards to establishing a network sustainably, however there are a few outliers to be assessed.

"No. 8 Active public support" may turn into a challenge as time progresses, this is also true of "No. 9 implementation of network support programs", the reasoning will be discussed in the Challenges section. The last two points in the table do not stem from the literature, but from the interviewees. Starting with "No. 10 Solutions need to be scalable for internationalization", it was important for two of the interviewees to articulate that the solutions, which will be dealt with in connection with the network, must be internationalized. This is due to the size of Denmark being quite small and developing something big for a huge industry (MM) will be too small and costly for it to be feasible. Lastly "No. 11 Communication", it has been expressed by a few of the interviewees that the scope, intention and process of the FBI project seem vague and perhaps hard to grasp. The fact that the FBI project only just started in April 2023 may have something to do with this, but nonetheless it is an important point to make; clear communication from and with the network is very important.

Challenges in the FBI project and potential failures of a network:

This section encompasses the challenges the FBI project faces or might face in the future. The challenges are compiled from our interview data we collected from different economic and network partners of the project who formulated opinions based on previous experience. This section also draws knowledge from the previous chapters to assess the difficulties.

The first part of this section deals with potential challenges in the future. In the section above we realized two requisite factors, which are currently fulfilled, but when the ES led FBI project with funding through Interreg ends in 2026, these two requisites will turn into challenges for the project.

8. Active public support

As mentioned in the analysis of the double triple helix, we found that the policy maker helix is present through the Interreg Europe funding of the project. We also found that this was the

weakest helix of the three. When the project ends in 2026 there is no immediate evidence of public support in other ways. If this is not fulfilled, the double triple helix will be lacking one of the helixes, which is a concern as a full double triple helix is a requisite of a successful cross-border network. It is at the same time a fundamental instrument of the RIS framework.

9. Implementation of network support programs

Currently, ES is leading the FBI project but with the end of the project in 2026 this will cease to be the case. When ES is no longer functioning as a network support program for the FBI project, a new one should be identified. This is where the question of network management comes into practice. A few project partners have expressed who they believe could take the lead and what their tasks would be, but these need to be established properly.

Naturally, since the project has only just started there should be time to spare for this discussion. If these problems are addressed in the future, it will potentially hinder the sustainability of the project (Mikhaylov, 2013c).

The FBI project deals with additional challenges. Table 4 below illustrates the difficulties we have collected from the interview data, structured around the common topics of communication and structure.

Table 4: Structured view of the challenges mentioned in the interviews.

Communication	Structure
Unclear end goals	Not all SMEs want to go international
Finding clear mutual benefits	SMEs don't have a lot of free time
Keeping a tight schedule	Size of the project
Competition	Project partners are treated unequally
Distance and culture diffenrences	Dependency on outside funding

Source: Own production based on primary data collection.

Communication

Clear communication is essential to a successful network (Zashev, 2012, PPIC#1, 2023, E:144). This paragraph will elaborate on how communication problems might arise and what repercussions they can cause.

One of the main concerns of the interviewees is the vague communication of the end goals (PPIC#6, 2023, E:75, PPIC#5, 2023, E:86, PPIC#3, 2023, E:94, PPIC#4, 2023, E:156). This causes doubts in many interviewees. Doubt may lead to less attendance and less motivation, which could become the end of a project like the FBI. Innovation is hard to grasp as an end goal (PPIC#1, 2023, E:87), especially if the project is as big as the FBI project. SMEs can see meeting committees as sales committees; therefore, if the goals are not kept in mind, the innovation aspect could change into only exchanges of services between the participating SMEs (PPIC#4, 2023, E:110). Moreover, finding advantages for all parties involved will be a great challenge for the project (PPIC#6, 2023, E:76, PPIC#5, 2023, E:80). Benefits and incentives must be clearly communicated to all participants which will be a challenge considering the number of the partners (PPIC#1, 2023, E:90, PPIC#5, 2023, E:78 & E:80).

What could be concluded from the interviews is that the participants of the project need to stay in touch (PPIC#4, 2023, E:122). Making partners talk to and visit each other is viewed as a challenge. To stay on top of this difficulty, exceptional project management is needed, with times and dates of meetings communicated well in advance, so the participants can prepare (PPIC#2, 2023, E:136, E:137 & E138, PPIC#3, 2023, E:95). This is especially true for the SMEs, as they might not have much time to participate in project events (PPIC#5, 2023, E:79).

Competition between the SMEs as a difficulty is debatable, the interviewees have different opinions on this topic. Some of them opinionated that the SMEs are open to cooperation since they realize they cannot drive the market or innovate alone and they do not see SMEs from other countries as direct competitors (PPIC#2, 2023, E:111 & E:112). Others say that SMEs in the same industry would not share their R&D and future plans with their competitors out of fear of getting “run over” because of that (PPIC#4, 2023, E:104, E:105 & E:109).

The FBI project being a cross-border project raises other possible difficulties of differences within the Danish and German working culture or the physical distance between the participants of the project as Koschatzky (2000) found and PPIC#3 (2023, E:157) discussed. One of the interviewees stated optimistic opinions about these potential problems, saying the

two countries are neighbors, thus these difficulties are not so relevant (PPIC#2, 2023, E:114). However, a few mentioned that networks like the ones the FBI project wants to develop, can only be sustained with participants frequently keeping in touch in person, which in this cross-border case would prove to be expensive in resources (PPIC#1, 2023, E:89, PPIC#4, 2023, E:119).

Structure

This section discusses the difficulties that are related to the structure of the project. It is aimed to discuss challenges that (might) arise from the FBI project being built up of SMEs, the size of the project, the differences between the partners' positions within the project and lastly, financial concerns.

The interviews supplied us with perspective on the economic region of Zealand and the state of Schleswig-Holstein in Germany. While it might not be the case in Northern Germany, the MM SMEs in the region Zealand are mostly small, family-owned businesses who might not desire to go international with their business (PPIC#1, 2023, E:120).

Another concern about SMEs was raised; if the innovation challenges require too much company involvement, the SMEs may not find them worthy of the time and resources that is needed to be allocated (PPIC#3, 2023, E:96, PPIC#5, 2023, E:79). This phenomenon can become more severe if the previously discussed communication difficulties are also at play, such as unclearly communicated advantages, or the lowered motivation caused by not being connected enough in person due to the physical distance.

The size of the project was also mentioned as a difficulty in achieving success. One of the reasons the project SUBMARINER was successful is the smaller size of the project, which generated a "family" like feeling within its participants and even an addition of new partners - a small addition compared to the FBI project - was debated between the members (PPIC#2, 2023, E:123). Reaching this "family" status inside a bigger project like the FBI might be a challenge (PPIC#2, 2023, E:124).

During the interviews, a concern was voiced in terms of the overall structure of the project. Some partners are economic partners, while others do not provide a budget for the project. This will result in an unequal cooperation between partners (PPIC#4, 2023, E:151) in which case

some partners might feel they deserve more decision power, alternatively, others might feel treated unequally.

A different challenge in the FBI project was seen within the financial aspect. After the starting funds provided by the EU get depleted, the project will be dependent on continuous outside funding. As EU projects tend to struggle to stay alive after the original funding is exhausted (PPIC#6, 2023, E:125), simple membership fee structure will not suffice in keeping the project sustained. On the contrary, several sources must provide outside funding in order to reach a financially stable state (PPIC#2, 2023, E:140).

Structural transformation of an international cluster

An international, or in this case, a cross-border network can inhabit different stages depending on the structural transformation the network undergoes. The systems of the international cluster interactions in the literature review gives an overview of the different stages and the development process. As mentioned in the beginning of this chapter, the FBI is in the beginning phase. There are clusters or industry associations on both sides of the border, but an international network does not exist yet in the FBI project. Therefore, this part of the analysis fully relies on the understandings of the project partners of what the international network should be and in turn, which stage of the structural transformation the international network resides in.

One of the official aims of the FBI project is to "develop cross-border networks" (Erhvervsministeriet, 2018). It is unclear at this point if the mentioned network, by definition, is an international network or a cluster network. Many project partners mentioned that the goals are not clear to them (PPIC#4, 2023, E:117, PPIC#3, 2023, E:94, PPIC #6, 2023, E:75, PPIC#5, 2023, E:86). Contrary to that, it is mentioned that the project partners are involved in defining the project along the way (PPIC#1, 2023: E:164). Furthermore, the development process also depends on the mindset of the project partners and the companies involved (PPIC#4, 2023, E:156, PPIC#5, 2023, E:82). Expectations of a few project partners are more corporations and a more international environment and connections (PPIC#7, 2023, E:58, PPIC#3, 2023, E:93, PPIC#1, 2023, E:46). These hints towards an international network or an ICNS. Thinking of a further structural transformation are PPIC#5 and PPIC#2. These project partners are discussing collaboration across clusters and industries for more opportunities and to operate in a complex

environment. Furthermore, the aspect of divers funding is mentioned. (PPIC#5, 2023, E:11, E:25, E:67, PPIC#2, 2023, E:139)

The FBI cross-border network in the MM sector does not exist yet within the border-region of Germany and Denmark. Therefore, it is not yet clear what structural transformation the international network will undergo. The interviews with the project partners point in both directions of an ICNS and an ICN. Mikhaylov (2012) uses the stage of the ICN as the most mature stage an international network can develop to. Therefore, it is in the interest of the FBI project to aim towards going through the entire structural transformation with the goal of establishing an ICN that possibly connects the MM cross-border network with other clusters in different industries to foster innovation intersectional.

6.0 Discussion

A logical reasoning based on the literature review and the theoretical framework about the development of a successful network is that the anchoring of the network happens through the existence of the requisites of and the void of challenges in the network.

Putting the requisites and the potential challenges of the network up against each other, we can see that the requisites met by the FBI project widely outnumber the potential challenges which leads us to assume that the network is going to be successful. The best chance at success comes through maximizing the fulfillment of the requisites and the minimization of the potential challenges. This means that the FBI project needs to address the potential challenges of missing active public support and lacking implementation of network support programs in the governmental part of the doubled triple helix model. Interreg, as the project investigator and partial funder, and ES, as the project leader, need to be replaced in 2026 to ensure the successful continuation of the network. Furthermore, the FBI project should address the current challenges of communication and structure head on to avoid any project failures.

One important addition to a sustainable anchoring of the network is network management. Based on the findings of the literature review, a successful network needs some sort of management to function. PPIC#2 agrees with that sentiment and mentions the requirement of

a formal leader and professional network management (PPIC#2, 2023, E:140). Who this leader could be, is seen differently. PPIC#7 sees the economic partners as leaders while other see the existing clusters and industry associations either in Germany or in Denmark as network leaders (PPIC#2, 2023, E:134, PPIC#1, 2023, E:130). This leader would fulfill the tasks of organizing meetings and actively drive the relationships (PPIC#3, 2023, E:133, PPIC#1, 2023, E:131). Furthermore, a developed roadmap or action plan are important at the end of the FBI project for the leader to follow (PPIC#2, 2023, E:137). To close this discussion, it needs to be mentioned that PPIC#6 specifically mentions that they are hopeful about the success of the development of a cross-border network in the MM sector (PPIC#6, 2023, E:128).

7.0 Conclusion

The FBI project is still in the starting phase as it only began in April 2023. This means that all conclusions and findings may be subject to change by future findings in the ongoing research process. As the FBI project progresses from here it must certainly become clearer and more nuanced.

In referring to table 2; technically the FBI project aims to develop cross-borders cluster based on the definitions found in the literature and the understanding of the project partner, they do however call it a network because of the terms wider use in definition and the local and transnational (EU) policies about clusters.

It is apparent that there is evidence of a double triple helix setup in the FBI project; there are policy makers, business organizations and knowledge institutions incorporated on both sides of the border although the policy maker part is the weakest. The double triple helix can be deduced as a requisite for a successful network. Based on the literature discussion compared with the findings of the interviews, several more fulfilled requisites have been identified, 8 of these came directly from literature with support of the project partners, and two of them came from the project partners. Some challenges have been established next to the requisites, perhaps the biggest being the lack of active public support and implementation of network support programs after the project is finished in 2026. The difficulties at play are structured around the

topics of communication and structure. The findings of challenges draw mainly from the project partners and the findings of the literature. It is not clear what structural transformation the international network will undergo, this because the FBI cross-border network in MM sector does not exist yet both Germany and Denmark. The interviews with the project partners point in both directions of an international network structure and an ICN.

The FBI project should strive to mitigate the mentioned challenges while incorporating as many requisites as possible. Furthermore, it should aim towards working through an entire structural transformation with the goal of establishing an ICN that possibly connects the MM cross-border network with other clusters in different industries to foster innovation intersectional. This provides the best foundation for innovation and economic growth.

8.0 Reflection

The scope of this paper was narrowed to only involve the MM sector of the FBI project, this means a limit was held against how many project partners were able to take part in the interview process. If there had been more, perhaps a more nuanced result could be present in the findings.

The literature review could have involved more articles through further research, this in turn could have added to the scientific discussion about clusters and networks.

This paper has been working through the epistemological view of modern hermeneutics, which has enabled the researchers to interpret the findings through the interviews and furthermore gain an in-between-the-lines understanding of the literature under review. If the researchers had used a different school of thought, the results and findings of this paper may have looked different.

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PPIC#1 (2023, May) Coding of interview of Project Partner 1.

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PPIC#2 (2023, May) Coding of interview of Project Partner 2.

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PPIC#3 (2023, May) Coding of interview of Project Partner 3.

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PPIC#4 (2023, May) Coding of interview of Project Partner 4.

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PPIC#5 (2023, May) Coding of interview of Project Partner 5.

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PPIC#6 (2023, May) Coding of interview of Project Partner 6.

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PPIC#7 (2023, May) Coding of interview of Project Partner 7.

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