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The Governance of Maritime Clusters and the Impact on Sustainable Development and Social Capital

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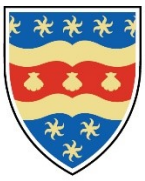

UNIVERSITY OF PLYMOUTH

THE GOVERNANCE OF MARITIME CLUSTERS AND THE IMPACT ON SUSTAINABLE DEVELOPMENT AND SOCIAL CAPITAL

By

DAVID GARETH ADKINS

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Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

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Abstract

GOVERNANCE OF MARITIME CLUSTER ORGANISATIONS AND THE IMPACT ON SUSTAINABLE DEVELOPMENT AND SOCIAL CAPITAL

DAVID GARETH ADKINS

Clusters have become an almost de facto choice for regional development policymakers around the world and across nearly all industries. The maritime industry is no exception, with maritime clusters emerging in most maritime nations across developed and developing economies. There has been considerable focus to date on the development of clusters, and in particular policy-driven organisations and their impact on regional economic development and innovation. Less emphasis has been on their impact in socio-economic and environmental terms. It is commonly accepted that economic, social and environmental values must be combined in order to achieve sustainable development. The governance of such cluster organisations remains an under-developed aspect of the cluster literature. The measure of governance in this instance is the perception of governance in the eyes of the member firms within maritime cluster organisations.

Set against this background, this thesis employs a multi-phase approach to investigating perceptions of cluster governance and its effect on both social capital and sustainable development in maritime cluster organisations. Using existing theory, the research uses template analysis to analyse interview data from twelve cluster practitioners and member firms. The results from this preliminary qualitative phase informed the development of the questionnaire used in the quantitative phase of the research. The questionnaire was distributed to nine maritime cluster organisations across seven countries. The results from these questionnaires were analysed using a variance based statistical technique called Partial Least Squares Structural Equation Modelling.

The findings from this research have four aspects; the first major finding is that a positive perception of cluster governance amongst member firms enhances both sustainable development and social capital within maritime cluster organisations. Secondly, social capital has been found to enhance sustainable development within the member firms of maritime cluster organisations. The third major finding is that social capital acts as a mediator in the relationship between cluster governance and sustainable development. The fourth finding and outcome of this research is the model of cluster governance that can be adopted by cluster managers to enhance the sustainable development of businesses within their organisations.

This research has practical implications for the managers of maritime cluster organisations. The empirical evidence provides cluster managers with support for clear strategic policy objectives designed to enhance cluster governance, and also for actions designed to improve the perception of governance. There are also implications for researchers focused on clusters, cluster policy and cluster governance with the empirically tested model of cluster governance contributing to the cluster governance literature.

Contents

List of Abbreviations

Abbreviation	Meaning
AVE	Average Variance Extracted
CAP	Collective Action Problem
CMN	Cornwall Marine Network
FDI	Foreign Direct Investment
FMC	Flanders' Marine Cluster
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GRP	Gross Regional Product
IISD	International Institute for Sustainable Development
ILO	International Labour Organisation
MCCN	Maritime Cluster Copenhagen North
MCO	Maritime Cluster Organisation
ML	Maritime London
NAO	Network Administrative Organisation
NCE	Norwegian Centre of Expertise
NCEMC	NCE Maritime CleanTech
OA	OceansAdvance
PEMS	Port Energy Management Systems
PLS-SEM	Partial Least Squares – Structural Equation Modelling
R&D	Research and Development
SBM	Sustainable Business Models
SMTF	Swedish Maritime Technology Forum
SYG	Super Yacht Group
TA	Template Analysis
TBL	Triple Bottom Line
TMN	Tasmania Maritime Network
VAF	Variance Accounted For

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Chapter 1. Introduction

1.1. Research Background

"Maritime business is exceptional, diverse, and peculiar."

(Stavroulakis et al., 2019 para 2)

In keeping with many other industries, the maritime sector has witnessed significant changes in the geographical patterns of economic activity and the application of technology over the last century (Heaver, 2012). One outcome of these changes has been the adoption of cluster organisations to reinvigorate the so-called 'blue' economy in many traditional maritime regions, and to enhance the development of emerging blue economies. In its broadest sense, blue economies can be viewed as those economies who use the sea and associated resources in such a way as to create sustainable economic development, enhanced wellbeing, whilst seeking to reduce its environmental impact (WWF, 2018).

Emerging over time, maritime clusters have generally been linked to the presence of natural resources, typically around ports as the sea-land interface (Zhang and Lam, 2017; Shi et al., 2020a). It is argued that such clusters can contribute to the growth of the blue economy, and as a result, maritime clusters have become a central part of the economic development policy landscape, with competitive advantage and innovation forming core objectives within many cluster associations (Myles, 2017; Department for Transport, 2019).

There has been focus on the use of such resources, termed natural capital, and also social capital which is manifested through the local maritime (business) community and commitment to the industry of those within the community. The relationship between natural and social capital can provide the necessary

background conditions for growth within the blue economy (Southampton Marine and Maritime Institute, 2017). There has been little examination of the role of cluster governance in maritime clusters led by cluster organisations. Maritime cluster literature typically focuses on the development of maritime clusters in terms of their potential development (Holte and Moen, 2010; Othman, Bruce and Hamid, 2011); competitiveness (Laaksonen and Mäkinen, 2013); links to innovation (Doloreux, 2008; Doloreux and Melançon, 2008; Viederyte, 2013; Makkonen, Inkinen and Saarni, 2013; Djoumessi, Chen and Cahoon, 2019); or economic development benefits (Viederytė, 2012; Maritime Administration, 2013; Sigfusson, Arnason and Morrissey, 2013; Viederyte, 2013; Wang et al., 2020).

There is a growing body of literature focused on governance across different industries, clusters, agglomeration economies and industrial districts. Early focus on network governance tended to focus on the distribution of power and how issues of decision-making were affected by the environment in which firms operated (Sacchetti and Tomlinson, 2009). More recently, focus has shifted towards the participation of firms within governance structures, e.g. Abbey, Tomlinson and Branston (2016); the development of governance frameworks (Berthinier-Poncet, 2014; Cassanego Júnior et al., 2019); and the role of governance in enhancing performance (Tomlinson and Branston, 2018; Barzotto et al., 2019). Perceptions of governance are generally accepted as being proxies for governance itself (Abbey, Tomlinson and Branston, 2016; Ford and Ihrke, 2019).

Studies have examined governance in the context of ports and port-related clusters (de Langen, 2004, 2006; Brooks and Pallis, 2008; Lam, Ng and Fu, 2013a; Acciaro et al., 2014; Vieira, Kliemann Neto and Amaral, 2014;

Haezendonck and Verbeke, 2018), with some authors identifying governance as a key factor within general maritime clusters (Koliousis et al., 2017; Carpenter and Lozano, 2020). This is potentially problematic for managers given the breadth of heterogeneity in maritime clusters. Recent studies have started to investigate the strategic management, including governance, of maritime clusters (Koliousis et al., 2017; Shimengah, Gathenya and Otieno, 2019; Stavroulakis et al., 2019), but this remains an under-developed area. Whilst clusters have been cited as a key part of maritime growth strategies (Department for Transport, 2015, 2019), there is less emphasis on their governance or how they should be operated.

Economic strength is at the heart of sustainable development; there is a convincing argument that a business that is not economically viable is not sustainable. Despite this initial economic focus, sustainable development extends beyond economic activity and key aspects have not been fully explored in the general cluster literature, and especially so in the maritime cluster literature. In keeping with general theories of sustainable development, for example the triple bottom line that incorporates economic, social and environmental aspects (Elkington, 1997), sustainable development in the maritime sector extends beyond competitive advantage and economic development, taking in other socio-cultural and environmental factors. There is little in the literature linking cluster governance generally, and the dimensions of cluster governance specifically, with sustainable development, beyond the economic dimension, especially in the maritime context.

Given the need to combine natural and social capital for growth in the blue economy, this needs to be addressed.

1.2. Definitions

Given the breadth of definitions, and their importance in framing the scope of this research, and in any subsequent application of findings, this section provides key definitions pertinent to this research and that will be applied throughout.

1.2.1. Clusters

Defining clusters can be a somewhat problematic task, with academics unable to reach a position of complete agreement (Richardson, 2010). Definitions can be lost in 'semantic ambiguity' (Paniccia, 1998 p. 668), due in part to the evolution of the term, variety of cluster structures, and varying application of the concept; even the names attached to similar structures vary by application (Martin and Sunley, 2003; Maskell and Kebir, 2006). For the purposes of this research the following definition is used. Clusters are '*…geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions in particular fields that compete but also co-operate'* (Porter, 1998b pp. 197-198). Porter is widely credited with driving clusters to the fore of the economic development policy debate (Rehfeld and Terstriep, 2013), and so using this definition in this research is appropriate.

1.2.2. Maritime v Marine

With the exception of some cluster names, 'maritime' is used throughout the thesis rather than 'marine' to describe industry related to the sea. Whilst these terms are used interchangeably, there is a tendency towards using maritime to describe industry related to the sea, whilst marine refers to the sea and its flora and fauna (Hildebrand and Schröder-Hinrichs, 2014). This research follows that pattern.

1.2.3. Maritime Clusters

Using Porter's (1998b) definition of clusters as the basis, maritime clusters are defined for this research as “geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, associated institutions, and support mechanisms in the maritime industry who compete, but also co-operate.” The empirical stages of this research use the term ‘maritime cluster association’ to be mean organised maritime clusters led by a cluster organisation.

1.2.4. Cluster Organisations

These are “*legal entities that support the strengthening of collaboration, networking and learning in innovation clusters and act as innovation support providers by providing or channelling specialised and customised business support services to stimulate innovation activities, especially in SMEs*” (European Cluster Collaboration Platform, 2020 para. 2). Cluster organisations can have various forms, including non-profit organisations, public agencies, or companies (PWC, 2011).

Clusters with management organisations are distinct from other networks such as sector associations; it is the related variety and interconnected, interdependent nature of member firms that distinguish clusters. Whilst trade associations have long-established roles fostering networking, business support, training, influence and exchange of ideas (Tomlinson, 2012), clusters emphasise the role of research and development (R&D), innovation and collaboration within regional networks (Policy Research Corporation, 2008)

1.2.5. Maritime Cluster Organisations (MCO)

Maritime cluster organisations are defined in this research as those 'legal entities that support the strengthening of collaboration, networking and learning in maritime cluster associations and act as business support providers by providing or channelling specialised and customised business support services to stimulate maritime-related activities in order to increase economic growth and competitiveness[1].'

1.2.6. Cluster Managers

There has been growing focus on the role of cluster managers given that they are essential elements of cluster organisations, both in terms of competitive advantage and long-term sustainability. (PWC, 2011; Ingstrup and Damgaard, 2013; Horák and Matošková, 2018).

The role of cluster managers encompasses the management and organisation of work within a cluster [organisation] that seeks to enhance internal and external relations through the development of strategies, goals and activities (Horák and Matošková, 2018). It is cluster managers that provide the link between cluster governance and member organisations.

1.3. Research Aim and Objectives

The aim of this research is twofold:

- To confirm the nature of the relationship between the perceived governance of maritime cluster associations, social capital and sustainable development.

[1] This definition is based on the definition of cluster organisations provided by the European Cluster Collaboration Platform, 2020 para. 2).

- To develop a model of cluster governance that will enable maritime cluster managers to enhance the sustainable development of businesses within their clusters.

The following objectives were used to achieve this aim:

- **Identify the critical dimensions and relationships of cluster governance within maritime cluster associations.**

The first objective seeks to establish the critical dimensions of cluster governance and associated relationships within maritime cluster associations. This will contribute to the development of the cluster governance model that will subsequently be used to measure governance in the specific context of maritime cluster organisations. This is important given that maritime cluster associations encompass a very broad range of industries and sub-sectors, each with differing interests and objectives.

- **Develop a model of sustainable development applicable to maritime cluster associations.**

Similar to the first objective, the second seeks to establish a model of sustainable development that is relevant to organisations within maritime cluster organisations. Establishing a model of sustainable development that is relevant to the particularly heterogeneous nature of maritime cluster organisations is critical to this study to ensure that all parts of sustainable business are represented.

- **Examine the effect of cluster governance on social capital and sustainable development in maritime cluster associations.**

Clusters are argued to nurture relationships between firms to enable collaboration and the achievement of shared values and objectives. A key driver of this is social capital, so this will assess the extent to which social capital is affected by cluster governance.

- **Examine the effect of social capital on sustainable development in maritime cluster associations.**

This objective is similar to the last; with social capital argued to be a crucial factor in the achievement of policy objectives, this seeks to establish the extent of the relationship between social capital and sustainable development. There is empirical evidence from a range of contexts to suggest that there may be a relationship, but little within the maritime business and cluster organisation context.

- **Examine whether social capital is a mediating factor in the relationship between cluster governance and sustainable development in maritime cluster associations.**

The purpose of this objective is to establish whether social capital will act as a mediator in the relationship between cluster governance and sustainable development. This will contribute to the managerial implications emerging from the research in terms of whether cluster governance should include focus on social capital.

Table 1.1 presents the research questions that will be addressed through this study.

Number	Research Question
1	What is the relationship between the perception of cluster governance and sustainable development in maritime cluster associations?
2	What is the relationship between the perception of cluster governance and social capital in maritime cluster associations?
3	What is the relationship between the perception of social capital and sustainable development in maritime cluster associations?
4	Does social capital have a mediating effect on the relationship between cluster governance and sustainable development in maritime cluster associations?
5	What are the critical factors and relationships that support effective cluster governance in maritime cluster associations?

Table 1.1 Research Questions

1.4. Significance of the Research

Clusters have become an almost de facto choice for regional development policymakers (Martin and Sunley, 2003). In recent years this position has become more prevalent across the maritime industry, with the United Kingdom's 2050 maritime strategy placing significant emphasis on clusters providing the means to deliver a long-term sustainable maritime economy (Department for Transport, 2019). With cluster organisations focused on developing long-term sustainable economies, their governance takes greater importance to the maritime economy. Work that goes towards addressing the overall research problem of whether cluster governance can enhance sustainable development will make a useful contribution to cluster policy development and implementation.

Many maritime cluster organisations have emerged from agglomeration economies and industrial districts that have historically developed from the nature of geography that places much maritime industry around the ports sector (Zhang

and Lam, 2017; Shi et al., 2020a). From this, an extensive maritime industry geographically located in particular areas has emerged. Unlike many regional clusters which are specific to a sub-sector of industry, maritime cluster associations represent a diverse set of firms. Firms that support the maritime industry are particularly heterogeneous in nature given the many activities linked to the economic exploitation of the sea. As these interests develop and evolve, they present governance challenges as each will have their own set of priorities and objectives.

1.5. Method

Whilst there was a general lack of literature examining the concept of sustainable development in maritime cluster organisations, there was a small, but growing body of literature concentrated on cluster governance. A more well-developed body of cluster governance literature existed in respect of clusters outside the maritime context. A more substantial and well-developed body of knowledge focussing on both social capital and on clusters existed.

In applying existing theories to the maritime cluster organisation context, this research employed a mixed qualitative and quantitative multiphase design, whereby a preliminary qualitative phase tested the theoretical model among cluster practitioners, followed by a quantitative phase testing the relationship between cluster governance, social capital and sustainable development in maritime cluster organisations. A critical realism position was adopted, given the researcher's view that whilst an external, objective reality exists that can be measured, individuals' understanding of that reality is influenced by their social conditioning (Saunders, Lewis and Thornhill, 2016).

A comprehensive literature review enabled the creation of the initial theoretical model, encompassing social capital, cluster governance, and sustainable development. The preliminary qualitative phase of the research was next, where this model was tested amongst cluster practitioners in three UK maritime cluster organisations. Template analysis was employed to test the model; this analysis resulted in the confirmation of the existing parts of the model, together with enabling the addition of a number of others.

This revised model was taken forwards as the basis for the quantitative phase. This phase used questionnaire data to test the relationship between cluster governance, social capital and sustainable development within maritime cluster organisations. As perceptions of governance are an acceptable proxy for governance itself (Abbey, Tomlinson and Branston, 2016), the questionnaire tested perceptions amongst member firms from Maritime London (UK), the Cornwall Marine Network (UK), the Tasmania Marine Network (Australia), OceansAdvance (Canada), Super Yacht Group (Australia), Maritime Cluster Copenhagen North (Denmark), the Flanders' Maritime Cluster (Belgium), the Swedish Maritime Technology Forum (Sweden) and NCE CleanTech (Norway).

PLS-SEM was then used to test the research hypotheses as it is appropriate for research of this nature, can handle small sample sizes and can be used to predict relationship effects.

1.6. Research Contribution

There is a wide-ranging body of literature examining clusters; despite this there are a number of gaps which remain; these gaps are addressed in this research.

There are numerous studies that examine the development and role of governance within clusters and cluster organisations (De Propris and Wei, 2007; Berthinier-Poncet, 2014; Abbey, Tomlinson and Branston, 2016; Cassanego Júnior et al., 2019). There is significant empirical evidence that links clusters with increased innovation, firm performance and regional development (Nooteboom, 1999; Carbonara, 2004; Gordon and McCann, 2005; Rialland, 2009; Chapain et al., 2010; Rodríguez-Pose and Comptour, 2012; van Aswegen and Retief, 2020) but few that result in empirically tested relationships between cluster governance and sustainable development as a holistic concept.

Whilst firms have historically been keen to develop and sustain economic performance, so there has recently been more focus on furthering this to include objectives related to social and environmental resources (IISD, 2020). International Institute for Sustainable Development (IISD) further argue that sustainable development must be integrated into strategic business planning for such objectives to be realised. With maritime cluster organisations taking a central role in the strategic growth of the maritime industry, there becomes a need to integrate approaches to enhancing sustainable development into the overall governance of the cluster organisation.

There is a gap in the cluster governance literature relating to an empirically tested model of cluster governance. This point has recently been cited as an area requiring further development as a lack of a universal model of cluster governance makes the evaluation of governance approaches difficult (Cassanego Júnior et al., 2019). This is especially problematic for cluster managers given the role of governance in achieving the desired strategic outcomes of the cluster organisation. This research presents an empirically

tested model of cluster governance focused on the three dimensions of normative, cognitive and political governance. This is of benefit to researchers seeking to examine the role of cluster governance, and also to cluster managers as it provides a framework to focus and evaluate their efforts.

Thirdly, and linked to the first issue, is that with many cluster studies focusing on innovation, firm performance and/or regional development, a significant gap in the cluster literature remains examining their impact on the other dimensions of sustainable development. This study focuses on the relationship between cluster governance and the three dimensions of sustainable development. This approach aims to provide an approach to cluster governance that considers environmental and social issues as part of the overall governance and strategic approach. This is of particular importance given the growing need to embed a holistic view of sustainable development into the strategic planning and management of organisations. This research presents a model of cluster governance that can be used by cluster managers to guide the development of policies to support sustainable development-related policies.

The final gap relates specifically to the maritime cluster organisation context. Whilst the literature examining maritime clusters has grown significantly over the last two decades, with studies focusing on the potential for clusters and their development (Othman, Bruce and Hamid, 2011); competitiveness (Laaksonen and Mäkinen, 2013); contribution to maritime innovation (Viederyte, 2013; Djoumessi, Chen and Cahoon, 2019); or economic development benefits (Sigfusson, Arnason and Morrissey, 2013; Wang et al., 2020)

Issues of governance have generally been confined to seaport clusters (De Langen, 2004; Bryan et al., 2006; Brooks and Pallis, 2008; Lam, Ng and Fu, 2013; Vieira, Kliemann Neto and Amaral, 2014); its use as an analytical tool (Brett and Roe, 2010); although some studies have recently made reference to its overall importance (Pinto, Cruz and Combe, 2015; University of the Aegean, 2017). This study aims to examine cluster governance within the general maritime cluster organisation context in order to develop a maritime cluster specific model of cluster governance. This is important as whilst clusters have been cited as a key part of maritime growth strategies e.g. Department for Transport (2019), there is less emphasis on how cluster organisations should be operated. The lack of a clear governance model for maritime cluster organisations is potentially problematic for managers given the breadth of firm heterogeneity in maritime clusters. Whereas many clusters have a relatively narrow focus, maritime cluster organisations are generally quite broad. ACCIÓ (2021) highlight the benefits of cross-colloboration between clusters and cluster firms. The maritime industry arguably benefits from similar cross-collaboration, but within one cluster. Whilst this can provide strength, the potential for conflicting interests and the reduction of perceived benefits is greater, this can motivate cluster members to leave; in turn contributing to the overall decline of the cluster (Østergaard and Park, 2015).

1.7. Scope

The scope of the research is limited to maritime cluster associations with a management organisation. Maritime clusters that do not fit the narrow definition of organisations, and that do not make member information publicly available have been deliberately excluded from the research. Given the policy objectives

intrinsically linked to maritime cluster organisations, there is interest in how their governance contributes to the success of those objectives.

The scope of the research is limited to perceptions of member firms. This is because perceptions of governance are generally accepted as a proxy of governance itself (Abbey, Tomlinson and Branston, 2016), and may indeed be considered as important as the governance structure itself (Ford and Ihrke, 2019)

Whilst it is recognised that there are a broad range of organisations within the membership structure of the cluster organisation, the term ‘member firms’ will be used to represent them all. This aids consistency and provides appropriate emphasis on the membership base. This also reduces the potential for confusion with the cluster organisation itself.

1.8. Structure of the Thesis

The thesis is made up of 10 chapters. Following this introduction, the thesis is structured as follows:

Chapter 2 introduces and defines maritime clusters. It discusses their contribution to regional economies and the role they play within the blue economy. There is also discussion of each of the cluster associations used in this research.

Chapter 3 provides a review of cluster governance, social capital and sustainable development literature, with emphasis on defining the concepts used in this study.

Chapter 4 presents the theoretical framework upon which this research is constructed. Relationships between cluster governance, social capital and sustainable development are shown, highlighting the link to the conceptual model and hypotheses.

Chapter 5 presents the philosophical position adopted, before presenting the methodological framework, including the research paradigm, the research approach and the methodology employed in the study. The chapter also includes overall ethical considerations. These aspects are justified by previous related studies. The multi-phase nature of the research means that the specific qualitative and quantitative phases are covered in separate chapters.

Chapter 6 is an end-to-end review of the preliminary qualitative phase of the research. The chapter starts with specific research methods used before examining issues of qualitative validity. Phase-specific ethical issues are considered before the development of the interview schedule is discussed. Template analysis is examined and justified, before the interview analysis is presented. The chapter concludes with final conceptual model.

Chapter 7 reviews the quantitative phase-specific research methods and development of the research instrument. The chapter covers specific ethical issues and the statistical technique (PLS-SEM) used in the study.

Chapter 8 presents the analysis of the results. The chapter starts with the sample statistics and characteristics, including non-response and method bias, before presenting the descriptive statistics for the key variables. The chapter then focuses on the PLS-SEM analysis. It presents the results of the tests for validity of the measurement model, before detailed analysis of the 1st and 2nd order structural models. The chapter concludes with the hypotheses being tested.

Chapter 9 is the discussion, starting with a review of the main findings of the study, before examining them in the context of the literature. The research questions are addressed systematically.

The main conclusions are drawn in Chapter 10, highlighting the relationship between the aim, objectives and research questions. Theoretical and practical contributions are presented; limitations are identified as are areas for future research.

Chapter 2. Maritime Clusters

2.1. Introduction

The maritime industry has exhibited many characteristics associated with clusters throughout its history. From the earliest times, related and connected businesses emerged that were typically geographically proximate, usually situated around harbours, with those in particularly good locations becoming important centres of trade. As a result 'littoral societies' of shared identities and values developed, focused around their maritime industries, where arguably they had more in common with each other than fellow peoples inland (Lockard, 2010).

Such groupings of industry (and associated socio-cultural factors) have in many cases become more organised over time, with clusters emerging. Cluster associations, and cluster organisations have developed, either through top-down policy interventions, or from bottom-up efforts of industry.

This chapter begins by exploring agglomeration economies in the maritime industry, before defining maritime clusters, examining their purpose and reviewing their contribution to economic development and the blue economy. The chapter moves on to discuss governance within maritime clusters, before concluding with a review of the nine maritime cluster associations used in this research, starting with a map of their location and summary of key features.

2.2. Clustering in the Maritime Industry

Throughout history, ports have been important centres of the maritime industry. Many related firms have grown up around ports, providing services to ships, cargoes and to the port itself. Firms relied on the fortunes of the port for their own success, and in turn ports depended on the strengths of inter-dependent and interrelated firms that

provided essential services. These port-centric networks have long exhibited characteristics of industrial districts first theorised by Alfred Marshall at the turn of the 20th Century. The development of Venice as a strategic maritime location at the beginning of the last millennium is the first maritime cluster in today's understanding of the term (Shi et al., 2020a).

As ports have grown from being simple nodes in transport networks to strategic, value-adding locations in global supply chains, many associated regional economies have become leading centres of the maritime industry. The ports of Shanghai and Rotterdam are synonymous with maritime trade, as Singapore and London are for maritime business services, and Busan is for shipbuilding.

Whilst recognising that ports, maritime business services and shipbuilding are significant parts of the maritime industry, the maritime industry is broader, encompassing a range of other activities, including education and training; equipment manufacture and repair; offshore supply; ship repair; recreational boating; fisheries and aquaculture; coastal/marine tourism; marine minerals mining; and offshore energy (Ianca and Batrinca, 2010; Pinto, Cruz and Combe, 2015; Stebbings et al., 2020). These sub-industries have grown up in coastal locations, but often away from major port cities, adding in a regional specialism to the industry. For example, leisure and tourism is the largest maritime sector in Cornwall, whilst direct and indirect super yacht support forms the core of maritime business in the Cairns region, and offshore energy dominates in Esbjerg and wider Jutland peninsula.

This breadth of activity and economic structure poses two key considerations: firstly, what a maritime cluster is; and secondly, why do maritime clusters matter? The next

section considers the first point and identifies different types of cluster within the maritime industry, whilst the second point is examined in section 2.2.2.

2.2.1. Defining Maritime Clusters

An early example of a maritime cluster is the *Federazione del Mare* (Italian Maritime cluster) that was founded in 1994. Many other nations have since followed, including the Dutch Maritime cluster in 1997, several clusters in the UK around the turn of the 21st Century and the French Maritime cluster in 2006 (Antonini, 2006; Janssens, 2006; Brownrigg, 2006; Vallat and Perennez, 2006). A review of the literature shows that maritime clusters have, over the last fifteen years, seen an increase in scholarly activity. Whilst the existence and growing popularity of maritime clusters is linked to Porter's seminal work, agglomeration of maritime firms has occurred for considerably longer, resulting in a variety of definitions emerging. The rest of this section considers varying types of agglomeration present across the maritime industry.

Zhang and Lam (2013) proposed a classification of maritime clusters based around scope of their activities; this is shown as Table 2.1. Whilst this does not provide one single definition, it does highlight different aspects of maritime clusters with some shared characteristics.

	Scope of Activities
Type 1	Cargo loading and discharging, cargo storage and distribution, transportation facilities, navigational service-quay, waterfront area and distribution channel
Type 2	Logistics in value-added processing for cargo: initially consolidating and distributing products, nearby industrial processing, combination, grouping, packing and commercial marketing
Type 3	Concentration and distribution of factors and production and information, relating to economic, financial, technological, communicational and international trade aspects
Type 4	Variety of maritime services provided: shipping services, regulators, industry associations, intermediate services, support services

Table 2.1 Classification of Maritime Clusters
Source: Adapted from (Zhang and Lam, 2013 p. 163)

This classification is specifically focused on activity, particularly those associated with moving goods by sea, and therefore overly constraining given the diversity of maritime businesses within a region; there appears to be little scope within this classification for an individual maritime cluster to be some of type 2 and a little of type 4. Furthermore the model, although employed in studies across the maritime literature (see Salvador (2014) as an example) does not account for the extensive scope of maritime activities. A more general classification focuses less on actors within the network, and more on the network itself. Doloreux (2017) presents three conceptually different perspectives: the first that views the maritime cluster as an industrial complex; the second defining a maritime cluster as an agglomeration of inter-linked industries; and finally, as a community-based network; this typology is summarised as Table 2.2. These three provide a more useful typology by reflecting the specific economic landscape of the place.

	Maritime Cluster as an Industrial Complex	Maritime Cluster as an Agglomeration of Interlinked Industries	Maritime Cluster as a Community-Based Network
Description	Maritime clusters are defined on the basis of inter-industry transactions as illustrated by input-output models and include a mix of maritime (and other) industries connected by important flows of goods and services.	Maritime clusters are defined on the basis of an agglomeration of industries linked to each other in terms of knowledge, skills, inputs, demand, and/or other factors.	Maritime clusters are defined on the basis of geographical concentrations of maritime industries within a regional community and presence of a network of firms and institutions that support development of industry.
Typical Definition	'A set of maritime activities which have direct (canal), indirect (bunkering and shipping agencies, shipping, ship chandlers, ship repair and maintenance, launch and pilotage services, dredging), induced (free trade zone, tourism, ports, container repair) and parallel (banking and insurance) effects on the maritime economy'.	Shipyards, ship equipment manufacturers, and ship consultants, and a plethora of other companies and institutions with maritime oriented activities.	A maritime cluster is a 'concentration of firms in a particular domain (maritime sectors), research and education organisations which are active in a related field and the presence of public support mechanisms operated by the government and regional stakeholders, through which actors share a common vision of growth and innovation strategies'
Core Concept	Inter-industry transactions between maritime and related industries.	Innovation and competitiveness of maritime firms.	Cluster structure, organisations, and localised dynamics of knowledge exchanges.
Key Characteristics	Sectoral dynamics (national).	Firm-level innovation and competitiveness (national).	Maritime cluster results from processes unfolding at local and regional level (regional).
Link to Markusen's (1996) typology of industrial districts	Marshallian, but more likely simple agglomeration or co-location.	Marshallian and also potentially state-anchored or hub-and-spoke, depending on context of cluster.	Italianate

Table 2.2 Typology of Maritime Clusters
Source: Author, based on Doloreux (2017 p. 216)

2.2.1.1. Clusters as an Industrial Complex

The first of the three definitions views clusters as an industrial complex, whereby a maritime cluster can be defined as a cluster of economic activity focused on driver industries who are linked through production and consumption, and resulting flows of goods and services (Doloreux, 2017). This model downplays effects of localisation, focusing instead on cognitive proximity and industry relatedness (Morrissey and Cummins, 2016).

Whilst this highlights the related and inter-connected nature of firms, together with complex sets of relationships between them, there appears little recognition of the impact of competition and co-operation in geographically proximate groupings of firms. Studies that have employed this technique highlight key features of clusters in terms of geographical proximity as well as industry relatedness (Morrissey and O'Donoghue, 2013; Morrissey and Cummins, 2016; Salvador, Simões and Guedes Soares, 2016), reinforcing the importance of geographical proximity in determining what constitutes a maritime cluster.

2.2.1.2. Clusters as an Agglomeration of Interlinked Industries

A simple definition of a maritime cluster based on agglomeration is "*a group of industries directly and indirectly related to shipping within a certain area or nation"* (Shinohara, 2010 p. 377). Whilst this encompasses the key aspects of more generic cluster theories, this definition is limited by the use of the word 'shipping', excluding areas such as recreational boating and fisheries. A broader definition indirectly includes some of these wider sub-sectors *"the maritime cluster is a functional entity in which the various industries, such as shipping, marine industries and port operations, are in close interaction with one another not only directly but also through their company networks"* (Viederyte, 2013 p. 625).

Both of these are closely linked to Porter's (1998 pp. 197-198) definition of clusters as being *"geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions in particular fields that compete but also co-operate…"* Innovation and collaboration for competitive advantage are key factors in the agglomeration of maritime firms within a region. These agglomerations are closely linked to the features of the Marshallian industrial district discussed in section 3.2.2. There is scope for these to exhibit characteristics of state-anchored or hub-and-spoke networks, but this will depend on the context in which the cluster operates, and to what extent the anchor entity has a controlling function. This definition forms the basis of maritime clusters that was introduced in Chapter 1.

Doloreux (2017) argues that lack of spatial boundaries is a limitation of this cluster type, as it becomes difficult to assess the impact of cluster processes in a region when the region is not well-defined.

A separate, but related body of literature has developed with focus on port clusters. As discussed earlier in this chapter, ports are a strategic part of the maritime industry, with inter-related and interdependent firms forming a cluster with a port at its core. Singapore is an example of this type of cluster; the region has evolved from offering traditional port and logistics functions to a global maritime business hub made up of a network of firms that fit Porter's definition (Jakobsen et al., 2017).

2.2.1.3. Clusters as Community-based Networks

Community-based networks exhibit three characteristics: connectivity with related firms and knowledge-support organisations; co-location contributing to competitive

advantage through factors such as knowledge creation and diffusion; and geographical proximity, including social capital (Doloreux, 2017).

There are similarities between community-based networks and agglomeration of interlinked industries discussed in the previous section. Drawing upon the definition used for agglomeration networks, the link to organisations which support innovation and business support can be added (Doloreux, 2017). This implies that such networks are more highly co-ordinated than in networks of related firms resulting in a structure that is similar to the Italianate variant of Marshall's industrial districts, with the co-ordinating body akin to Provan and Kenis' (2008) network administrative organisations.

The definition proposed by Doloreux & Shearmur (2009 p. 522) is more extensive; a maritime cluster is "*a geographic location (region) which has (i) a higher than average concentration of firms in a particular domain (in this case, maritime sectors), (ii) research and education organizations which are active in a related field, and (iii) the presence of public support mechanisms operated by government and regional stakeholders, through which actors share a common vision of growth and innovation strategies.*"

As a result of this discussion, support mechanisms were included in the definition used in this research. Maritime clusters are therefore defined as "geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, associated institutions, and support mechanisms in the maritime industry who compete, but also co-operate".

The breadth and diversity of the maritime sector means that such community-based networks in the maritime industry tend to emphasise geographical location first, rather

than a sectoral focus within a geographical location; see for example Mersey Maritime (Mersey Maritime, 2014) or North Sea Marine Cluster (NSMC, 2014) compared to the Lyon Urban Trucks and Bus cluster (Guisard, Le Bas and Nief, 2010) or the Zhili Children's Garments cluster (Zuhui et al., 2011).

Doloreux (2017) argues that the community-based network definition is quite narrow and can overlook activities related to the cluster that occur outside the region. There is discussion of the *local buzz-global pipelines* debate in section 3.2.4.3; whilst focus may be on regional aspects, external linkages can play an important role in a region's competitive advantage.

The agglomeration of interlinked industries and community-based networks are different faces of the same coin, albeit with the co-ordinating organisation being the key distinction. Having examined a typology of maritime clusters, a lack of clear consensus exists in the literature as to what constitutes a maritime cluster, beyond it being an overarching term to mean a variety of different structures and actor involvement. As highlighted by Doloreux (2017), the only real consensus is that maritime clusters develop from relationships between firms, and are close to coastal locations.

Whilst recognising this ambiguity in definition, maritime clusters with a management organisation exist in practice, and it is these clusters that form the basis of this research. In the empirical stage of the research, maritime cluster means a maritime cluster with a management organisation. The next section examines the contribution made by maritime clusters.

2.2.2. The Contribution of Maritime Clusters

Having examined what maritime clusters are, this section considers why maritime clusters are important. It starts by discussing their contribution to innovation; the second focuses on competitiveness; the economic contribution is then discussed, before the section concludes by briefly discussing their role within the blue economy.

2.2.2.1. Impact on Innovation

Innovation is argued to be a key driver of economic growth and competitiveness (Broughel and Thierer, 2019). Doloreux and Melançon (2008) argue that clustered maritime firms demonstrate higher levels of R&D, higher rates of new product and process development, and greater engagement in innovation projects than non-clustered firms; further support is offered by a range of authors, including Isaksen (2009); Lambrou (2016); Rupo et al. (2018); and Kitada and Bhirugnath-Bhookhun (2019).

Proximity is agued to be a key factor in this; Monteiro, de Noronha and Neto (2013) offer empirical evidence of geographical proximity fostering knowledge creation and diffusion in maritime clusters across northern Europe. Halse (2017) includes the role of maritime clusters in enhancing cognitive proximity as a driver of innovation.

2.2.2.2. Impact on Competitiveness

Maritime clusters have been shown to enhance the competitiveness of maritime firms (Othman, Bruce and Hamid, 2011; Viederyte, 2013). Whilst proximity is a fundamental part of this, co-ordination and the formation of cultural norms play important roles (Stavroulakis et al., 2019). Resulting reductions in transaction costs and perceived free-rider issues in co-operative activity can further enhance competitiveness and firm performance (de Langen, 2006). Knowledge is important to firms' competitiveness; the

growing strength of the network provides the means by which local and tacit knowledge is diffused through the cluster (Halse, 2017).

2.2.2.3. Economic Contribution

The maritime industry is significant to many regional and national economies, with maritime clusters making significant contributions to GDP, GVA and employment (Doloreux and Shearmur, 2006; Monteiro, de Noronha and Neto, 2013; Li and Luo, 2020; Shi et al., 2020a). Typically representing between 3%-5% of GDP across Europe (Pinto, Cruz and Combe, 2015), a significant part of the economic value of the maritime industry is focused on shore-based activity (Klinting, 2010). The shipping industry alone contributed €149 billion to EU GDP in 2018, directly employing 685,000 (Oxford Economics, 2020).

The economic contribution of maritime clusters is less clear from the literature (Kildow and McIlgorm, 2010; Morrissey, O'Donoghue and Hynes, 2011; Pinto, Cruz and Combe, 2015; Doloreux, Shearmur and Figueiredo, 2016); this is in part due to ambiguity in cluster definitions. For example firms within the Estonian maritime cluster provide approximately 5% of the total turnover of Estonian companies, but in acknowledging the lack of a formal cluster structure, the study recognises limitations of its findings (Portsmuth et al., 2012). Similarly, Laaksonen and Makinen (2012) consider the Finnish maritime cluster to consist of between two and three thousand firms, depending on definition, making it difficult to distinguish between cluster and sector; furthermore the terms cluster and sector are used interchangeably. Reports into both the maritime clusters of Seattle and Washington State have similar issues (Sommers and Wenzl, 2009; Mefford et al., 2013). The consistent finding across all studies is that the maritime sector makes a significant economic contribution to their locality.

The economic contribution is clearer when focusing on more formalised maritime clusters who are led by cluster organisations given their well-defined boundaries. Firms within the Blue Maritime Cluster in Norway had a turnover of 47 billion kr. (£4bn) in 2020, creating 15 billion kr. (£1.3bn) in added value (Blue Maritime Cluster, 2021). The Cornwall Marine Network has contributed £430m GVA to the Cornish economy since its creation in 2002 (Cornwall Marine Network, 2019e).

2.2.2.4. Role of Maritime Clusters in the Blue Economy

Focus on the significance of the blue economy has grown since the emergence of the term from the 2012 United Nations Conference on Sustainable Development. Whilst economic exploitation of oceans and associated policies is not new, adopting the term 'blue economy' has enabled a systematic approach to the management of ocean resources and socio-economic activities, whilst allowing sustainable development issues to be considered (Smith-Godfrey, 2016). The blue economy accounts for between 3%-7% of global GDP (World Bank, 2019; UNCTAD, 2020), and is predicted to grow from US$1.5 trillion of GVA in 2010, to at least US$3 trillion by 2030 (Rayner, Jolly and Gouldman, 2019).

The blue economy is defined as a sustainable ocean economy, where economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy (Economist Intelligence Unit 2015). With ocean economies focused on exploitation of the ocean for economic benefits, blue growth enables an unsustainable ocean economy to transition towards a more balanced and sustainable one (Patil et al., 2016).

Healthy and sustainable oceans are essential to large parts of the world's population who directly depend on them as a source of income and food, and indirectly through

international trade of commodities and goods (World Bank, 2020). In transitioning from an ocean economy to a blue economy, UN Sustainable Development Goal 14[2] provides a series of targets to guide activity.

Although there appears little in the literature that draws together direct environmental benefits of maritime clusters, it is argued that corporate social responsibility is important to SMEs in the maritime industry (Fjørtoft, Grimstad and Glavee-Geo, 2020). Some studies consider opportunities in developing environmentally friendly technologies (Laaksonen and Makinen, 2012), others highlight potential for collaboration and policy development in addressing environmental concerns (Mair, 2003; Policy Research Corporation, 2008; Morrissey, O'Donoghue and Hynes, 2011).

Empirical research from the west coast of Sweden highlighted the positive effect clusters had on facilitating cross-disciplinary R&D in the blue economy context (Myles, 2017). Rupo et al., (2018) highlight similar evidence from Italy where the Sicilian maritime cluster facilitated collaboration, access to external funding and sharing R&D among partners in a project (TESEO) focused on developing high efficiency, low environmental impact technologies for seagoing vessels. The co-ordinating and facilitating function of the cluster enabled firms and research bodies to collaborate on the design, implementation and testing of different approaches. These points are linked to those discussed in the previous section.

Evidence from seaport clusters offers further support to the benefits clusters offer in the co-ordination and facilitation of activity designed to meet sustainability needs; this is shown as Table 2.3.

[2] UN SDG14 Conserve and sustainably use oceans, seas and marine resources for sustainable development

Dimension of Environmental Sustainability	Seaport Examples
Environmental Knowledge	• Include environmental considerations in the planning and execution of connectivity policy and infrastructure. • Include environmental considerations in selection and management of tenants and in selection of cargo traffic or ship fleet. • Attention for sustainable construction methods when building infrastructure.
Environmental Management System	• Provide adequate waste reception facilities. • Include environmental considerations in selection and management of tenants and in selection of cargo traffic or ship fleet. • Include environmental considerations in the planning and execution of connectivity policy and infrastructure.
Value from Waste	• Provide adequate waste reception facilities
Resource Substitution	• Attention for sustainable construction methods when building infrastructure. • Include environmental considerations in the planning and execution of connectivity policy and infrastructure.
Resource Efficiency	• Create optimal space allocation and green recreational areas. • Ensure space is optimised in master planning.

Table 2.3 Seaport Application of the Dimensions of Environmental Sustainability
Source: Author, based on Acciaro et al., (2014 p. 485)

Innovation is an important factor in meeting sustainability needs; with maritime clusters contributing to innovation (Djoumessi, Chen and Cahoon, 2019), they are increasingly forming part of regional and national maritime economic development policies in support of blue economy aims (Myles, 2017; Department for Transport, 2019).

2.3. Maritime Cluster Organisations

Maritime cluster organisations (MCO) were defined in Chapter 1 as those 'legal entities that support the strengthening of collaboration, networking and learning in maritime clusters and act as business support providers by providing or channelling specialised and customised business support services to stimulate maritime-related activities.'

Cluster organisations are discussed in section 3.2.4.2; this section focuses on those in the maritime context.

The Policy Research Corporation (2008) define two types of MCO; national and regional. Similarities and differences are summarised in Table 2.4.

	National MCO (NMCO)		**Regional MCO (RMCO)**	
	Bottom-up	Top-down	Bottom-up	Top-down
Purpose	Generate volume to improve lobbying position	Create platform to enhance integrated maritime cluster policy	Direct interest of local industry	Focus on regional development and innovation
Scope	Almost every traditional maritime sector that is active in the country.		Almost every traditional maritime sector that is active in the region	
Focus	Labour, exchange of know-how, innovation and research, image building, environment and, public affairs.		Innovation and research, skills development, exchange of know-how and, business development.	
Finance	Limited funding, typically for management activity (additional activities often requires additional member funding).	High budgets, mainly for RDI-programs	Limited funding, increasingly depending on project financing	High budget, mainly for regional development
Size	Limited size (2-4 full time equivalent (FTE) employees)	Division of ministry	Limited size (1-2 fte employees)	Part of development agency or technology centre

Table 2.4 Similarities and Differences between National and Regional Maritime Cluster Organisations
Source: Based on Policy Research Corporation (2008)

Whilst there are differences between the purpose of each, and between top-down and bottom-up approaches, the fundamental aim of both is to increase competitiveness, promote the maritime industry, and enhance co-ordination and collaboration amongst members. Both NMCO and RMCO place emphasis on innovation and competitiveness, but RMCOs place greater emphasis on regional and firm level

benefits than do NMCOs. Funding of MCOs tends to vary depending on top-down or bottom-up approaches, rather than national or regional focus. NMCOs such as MaritimeUK and the French Maritime Cluster are bottom-up organisations and rely on sponsors/members for funding; this compares to Maritime Cluster Nord Deutschland who receive approximately 50% state funding.

The management structure of MaritimeUK comprises a small secretariat who manage day-to-day business, with a national council providing strategic direction that is formed from leaders across the UKs maritime industry (MaritimeUK, 2021). Within that framework are a number of regional clusters with a similar structure. This approach, both at national and regional levels, enables voices of often disparate body of members to be heard.

The maritime clusters surveyed in the empirical phase of this research are regional clusters, all with a regional maritime cluster organisation co-ordinating activity. These nine clusters are examined in the next section.

2.4. Maritime Cluster Associations: Research Context

Each of the clusters selected are of the community-based network type and meet the definition of MCOs. This section introduces the nine maritime cluster associations used in the empirical phase of this research. It identifies the background of each cluster and scope of their activities. Strategic objectives of each are considered, as is the nature of membership, funding and their governance structures. These factors are important to this research as they impact cluster governance, social capital, and ultimately the contribution clusters make to sustainable development within member firms.

The rest of this chapter focuses on these details, with sections for each cluster. Figure 2.1 shows the geographic location of each cluster used in this study. Table 2.5 provides a summary of key information for each cluster.

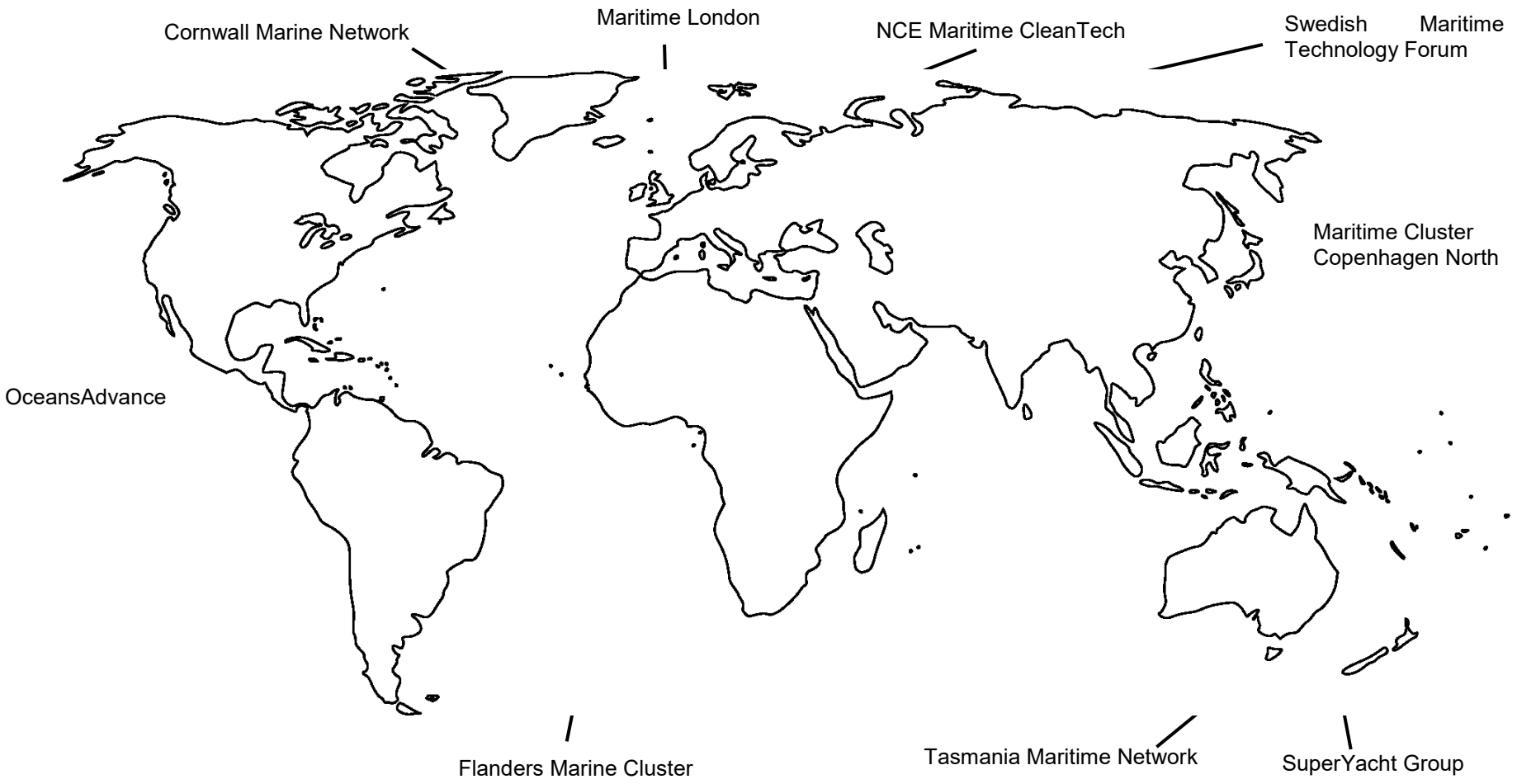

Figure 2.1 Location of Maritime Cluster Associations in this Research
Source: Author

Cluster	Country	Formed	Sector Focus	Aim & Activities	Cluster Manager	Members[3]	Funding	Website
Cornwall Marine Network	UK	2002	Marine businesses in Cornwall.	To give identity to, and improve economic prosperity of, businesses in Cornwall's world-class marine sector.	Yes	235	Member fees	https://cornwallmarine.net
Flanders' Maritime Cluster[4]	Belgium	2010	Coastal defence, offshore energy and marine aquaculture.	Networking events, facilitating collaborative innovation projects and demonstrations, and (international) promotion of blue sector.	Yes	104	Member fees	http://www.flanders-maritime-cluster.be/
Maritime Cluster Copenhagen North	Denmark	2016	Support green maritime growth; especially for areas with lower growth.	Joint activities, knowledge sharing and innovation projects in cluster.	Yes	71	Public / member fees	https://mdc.center/nmk
Maritime London	UK	2001	Maritime related business services and maritime trade.	To ensure that UK remains a world-beating location to base maritime related business and to conduct maritime trade.	Yes	93	Member fees	https://www.maritimelondon.com
NCE Maritime CleanTech	Norway	2011	Establishing sustainable innovation projects with commercial potential and working together for new clean maritime solutions.	Strengthen cluster partners' competitiveness by developing and launching innovative solutions for energy-efficient and clean maritime activities.	Yes	65	Public / member fees	https://maritimecleantech.no/
OceansAdvance	Canada	2005	Offshore energy, transportation, fishing and aquaculture	Ocean and marine-related technology, education, training, R&D, promotion, delivery and application.	Yes	87	Public / member fees	http://oceansadvance.net/
Super Yacht Group	Australia	2000	Direct and indirect super yacht industry.	Creating positive experiences for super yacht owners, crew, members and management.	Yes	73	Public / member fees	https://superyachtgroup.com/
Swedish Maritime Technology Forum	Sweden	2007	Shipping, offshore and leisure boat industry.	Skills, innovation and smart vessels.	Yes	85	Public / member fees	https://smtf.se/
Tasmania Maritime Network	Australia	1998	Manufacturing, engineering, logistics & shipping, training, clothing, safety equipment for commercial/military	To promote and advocate on behalf of all Tasmania Maritime Industry for benefit of members and industry as a whole.	Yes	30	Member fees	https://www.tmn.org.au/contact/

Table 2.5 Maritime Cluster Associations in this Research
Source: Author

[3] As at point of data collection (January 2017)
[4] No longer exists having become part of De Blauwe Cluster in 2018

2.4.1. Cornwall Marine Network

Cornwall is one of the poorest regions of the UK and amongst the poorest across Northern Europe; per capita, Cornwall's Gross Value Added (GVA) is approximately 68% of the UK, with Gross Domestic Product (GDP) 71% of the European Union (Cornwall Council Economic Growth Service, 2020). Set against this, the maritime economy of Cornwall contributes over £1.1 billion to the local economy, having doubled between 2008 and 2018. The number of maritime businesses in Cornwall grew by a third in the same period, with over 99% of the total being classed as SMEs. The maritime economy is recognised as being of significance to the overall economy of the region, contributing over 10% of GVA from only 3.5% of the total number of enterprises and a little over 3% of the total workforce. Innovation and entrepreneurship was found to be of importance to local firms, with over two-thirds reporting that new business development was very or quite important to their strategic direction (Cornwall Council, 2018; Cornwall Council Economic Growth Service, 2018; Pye and Alexander, 2018; Cornwall Council Economic Growth Service, 2020).

The Cornwall Marine Network (CMN) was formed in 2005 by a small group of business leaders from the maritime industry. The CMN is a not-for-profit organisation that is funded by membership fees and competitive funding, such as European Union Objective One funding. The aims of the CMN include sector representation, together with support to firms to enhance productivity, innovation, skills development, and to facilitate networking and collaboration across the region (Cornwall Marine Network, 2019b). Current CMN facilitated projects include skills development, working with young people in the region to attract

talent into the sector, innovation in marine technology and renewable energy, and process and product innovation in SMEs (Cornwall Marine Network, 2019c).

The CMN governance structure takes the form of Provan and Kenis' (2008) network administrative organisation, with a board of directors drawn from the membership base, and a management function which oversees day-to-day activities (Cornwall Marine Network, 2019a). There is relatively high co-ordination of activity within the network, with low centralisation of control (Arikan and Schilling, 2011).

Whilst the regional composition of the sector is quite diverse, over 50% of CMN membership is focused in four areas; leisure and tourism (16.73%), boatbuilding, maintenance & repair (15.37%), manufacturing and fabrication (11.15%), and training, education & community (9.05%) (Cornwall Marine Network, 2019d). Since its formation, the CMN has contributed over £430 million in GVA to the region (Cornwall Marine Network, 2019e).

2.4.2. Flanders' Maritime Cluster

The Flanders region contains the four largest seaports in Belgium: Antwerp, Ghent, Zeebrugge and Ostend. The maritime sector supports 46,000 full-time jobs in the region, contributing €26bn (£22.4bn) GVA to the Flemish economy (POM West Flanders, 2019).

The Flanders' Maritime Cluster (FMC) was formed in 2010 with the aim of promoting the Flanders maritime sector, developing relationships and collaboration between regional firms, developing knowledge networks, and supporting economic growth. The cluster organisation also co-ordinates funding

bids, particularly in areas of sustainability such as offshore windfarms, and maritime textiles.

The governance structure takes the form of Provan and Kenis' (2008) network administrative organisation, with a not-for-profit cluster organisation co-ordinating cluster activities. The board of directors are drawn from the membership base and West Flanders Development Agency, and a management function which oversees day-to-day activities. Cluster firms pay a membership fee to be part of FMC. Figure 2.2 shows the composition of members by sector.

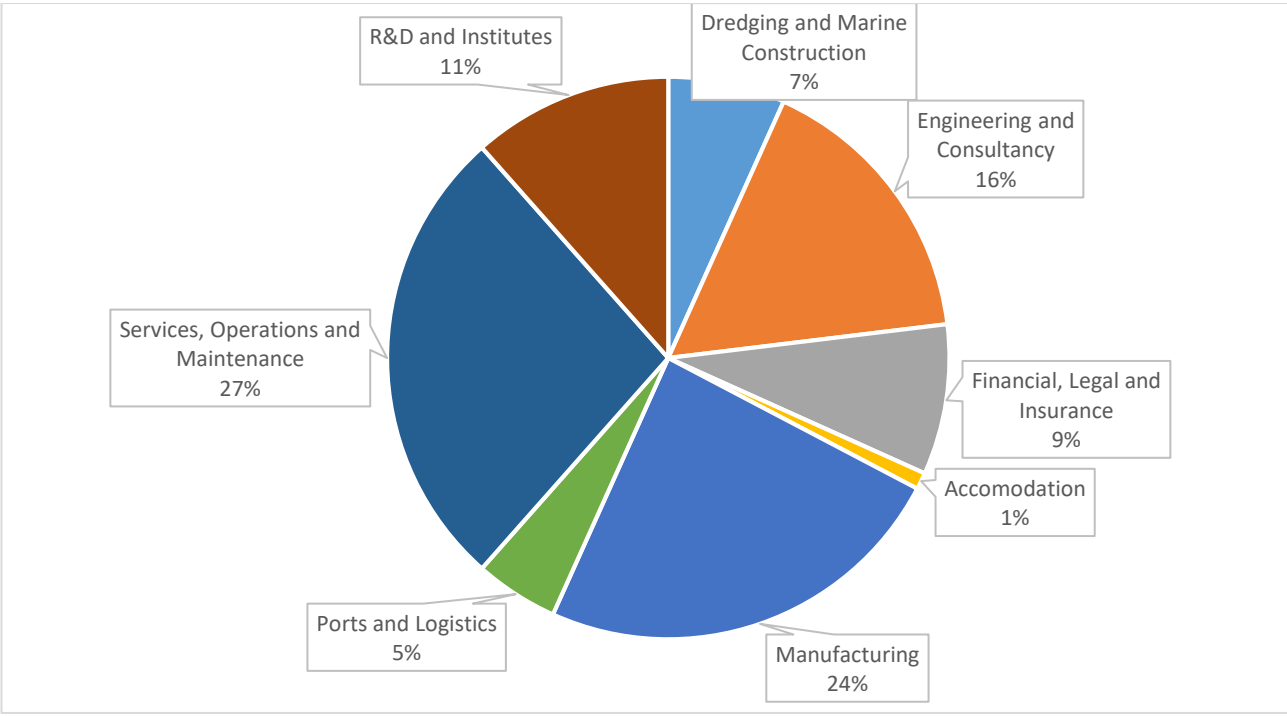

Figure 2.2 Flanders' Maritime Cluster Members by Sector
Source: Author, based on Flanders' Maritime Cluster (2014)

Manufacturing, engineering and service providers made up two-thirds of the membership base. The service providers largely provide support to manufacturing and engineering firms in the region. Only one firm in the cluster was not from the maritime industry. They provide accommodation near the port

of Ostend. In 2012 firms within the FMC had a combined €5bn turnover, employing 13,700 people (Flows, 2014).

The FMC became part of the Blauwe Cluster in 2018/19.

2.4.3. Maritime Cluster Copenhagen North

Denmark is a leading maritime nation with the industry contributing DKK 350bn (£40.6bn) to GDP and DKK 83.6bn (£9.7bn) to GVA. Shipping is the largest sub-sector contributing to GVA, with equipment second, and the maritime services sector in third. The industry employs over 60,000, rising to 96,000 employed indirectly (COWI, 2020). Maritime cluster development forms a key part of the Danish Maritime Sector Plan for Growth (Erhvervsministeriet, 2018).

Maritime Cluster Copenhagen North (MCCN) was established in 2016 with the aim of supporting the development and growth of maritime companies in North Zealand. The cluster is centred around the three commercial ports of Hundested, Gilleleje and Helsingør on the northern coast; the region is shown as Figure 2.3.

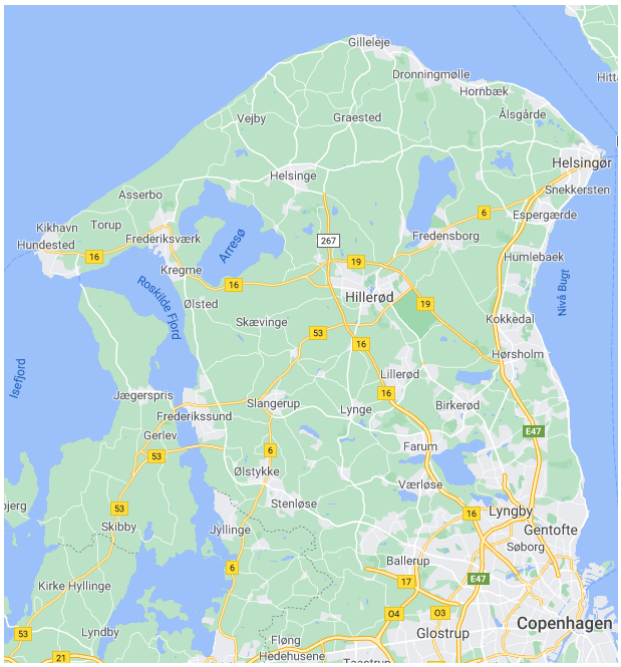

Figure 2.3 North Zealand Region
Source: (Google Maps, 2021)

The cluster has three focus areas: increasing awareness of clustered firms and their competencies, both within and outside the cluster, to encourage collaboration; develop business opportunities, with emphasis on sustainable development issues; and to develop a skilled labour market. SMEs account for 75 of the 76 members, with the other being a university (European Cluster Collaboration Platform, 2021c). Firms are largely focused on equipment suppliers, engineering, and port services.

The cluster is of the network administrative type, with a cluster manager and a board of directors drawn from members. There is relatively high co-ordination of activities to support the three focus areas. Cluster firms pay a fee for membership; other funds are drawn from government and EU, although no confirmation of the funding split could be obtained.

2.4.4. Maritime London

The maritime professional business services sector in the UK contributes nearly $6bn (£4.3bn) GVA and approximately 10,000 jobs. The majority of this is contributed by firms in London. With a market share of nearly 25%, London is one of the leading centres of maritime professional business services around the world. (Jakobsen et al., 2017; PwC, 2019). Insurance, law, and shipbroking are the largest sub-sector of industry, with nearly 80% of all maritime disputes arbitrated in London and more shipbrokers than in any other maritime city. Figure 2.4 shows a comparison of maritime centres by market share.

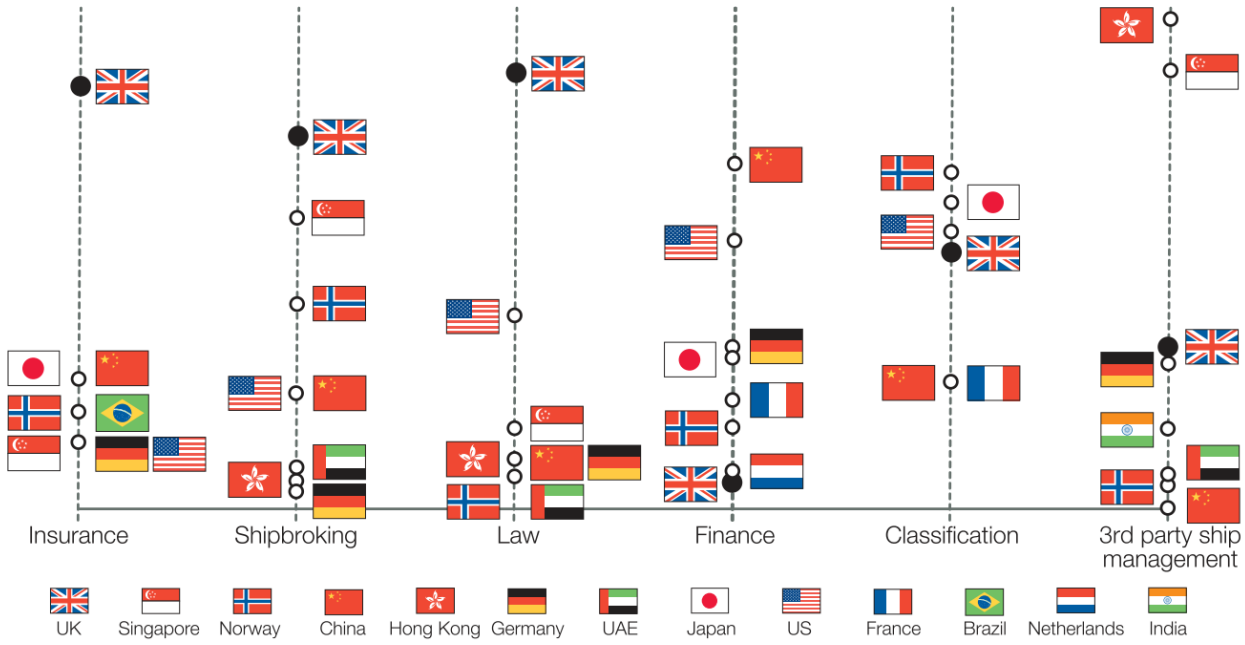

Figure 2.4 Indicative Market Share of Selected Maritime Centres by Service, 2018
Source: PwC (2019 p. 9)

Whilst the UK has a relatively low market share in maritime finance, many supporting services are present. In addition to these services, London is home to many international bodies, such as the International Maritime Organisation, International Chamber of Shipping and the International Association of Classification Societies.

Maritime London was established in 2001 to act as the representative body for maritime professional business services. Figure 2.5 shows a schematic representation of Maritime London's membership base.

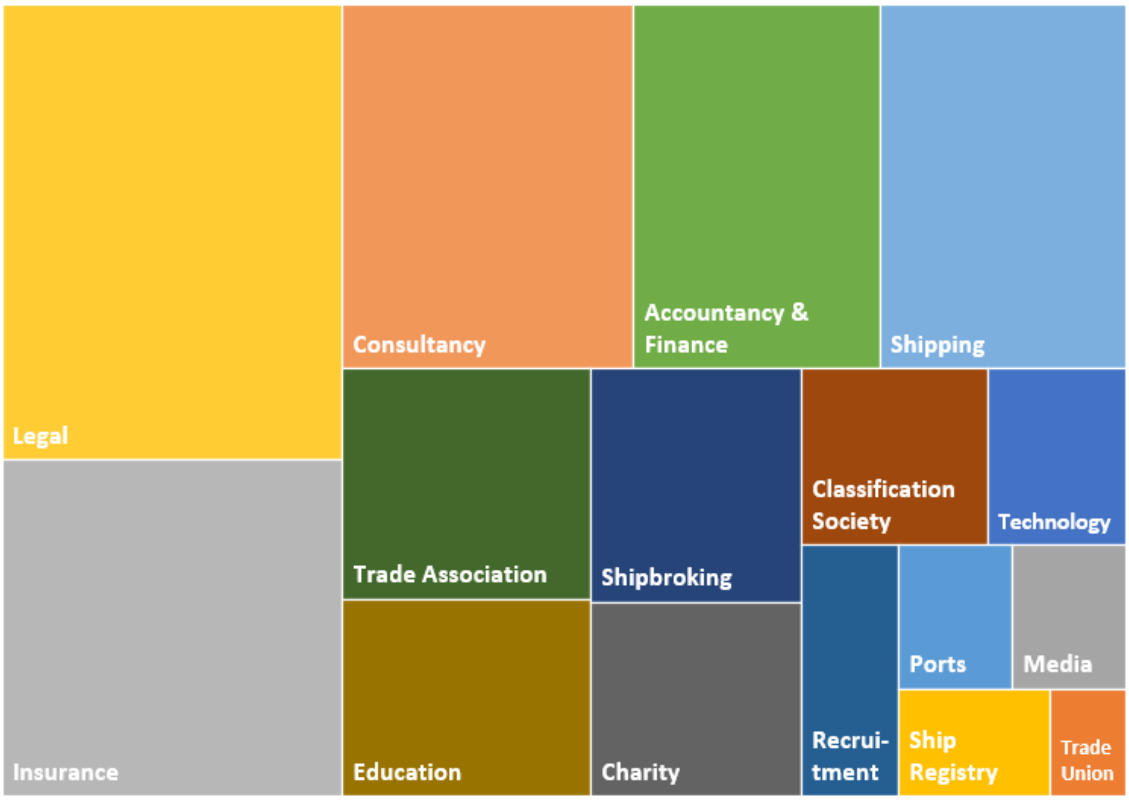

Figure 2.5 Maritime London Members by Sector
Source: Author, based on Maritime London (2015)

Legal services (17%), insurance (13%), consultancies (12%), shipping companies (10%) and financial institutions (10%) make up nearly two-thirds of the membership base, and generally reflects the cluster strengths discussed earlier.

The governance structure of Maritime London is of the network administrative organisation type. The board of directors is drawn from and elected by the membership base and an administrative team oversees day-to-day activities. Funding for the cluster comes from membership fees. There is low centralisation of control, but relatively higher co-ordination of networking, knowledge creation and diffusion and external representation (Maritime London, n.d.)

2.4.5. NCE Maritime CleanTech

The ocean industry has long been an important part of the Norwegian economy and is made up of three industries; petroleum, seafood, and maritime (Ministry of Trade Industry and Fisheries and Ministry of Petroleum and Energy, 2017). The maritime industry in Norway employs 110,000 people contributing approximately 10% of Norway's wealth creation at NOK 142bn (£12.06bn) in GVA (Norwegian Shipowners Association, 2019; Global Maritime Knowledge Hub, 2021).

NCE Maritime CleanTech was established in 2011 as a membership organisation; there were eight members from the shipping, shipyard, logistics and energy industries. In 2014 the cluster received Norwegian Centre of Expertise (NCE) status, meaning that the cluster received state funding through Innovation Norway. The NCE programme focused on increasing sustainable innovation, internationalisation, business support, and regional promotion; the programme closed in 2014 when it became part of the Norwegian Innovation Clusters programme (Innovation Norway, 2021). Cluster activities including funding support, strengthening the link between education and industry, formal and informal meetings, development of collaborative projects and promotion of the cluster and cluster firms. There are four expert groups that focus on shore power, hydrogen fuels, cruise industry, and political influences. These groups share knowledge about their respective areas and facilitate collaborative projects. As a result, NCE Maritime CleanTech act as a membership and lobbying body.

Firms within NCE Maritime CleanTech employ over 30,000 people, with revenues in excess of NOK 300m (£25.5m). Firms are drawn from across the maritime industry, with the breakdown of membership shown as Figure 2.6.

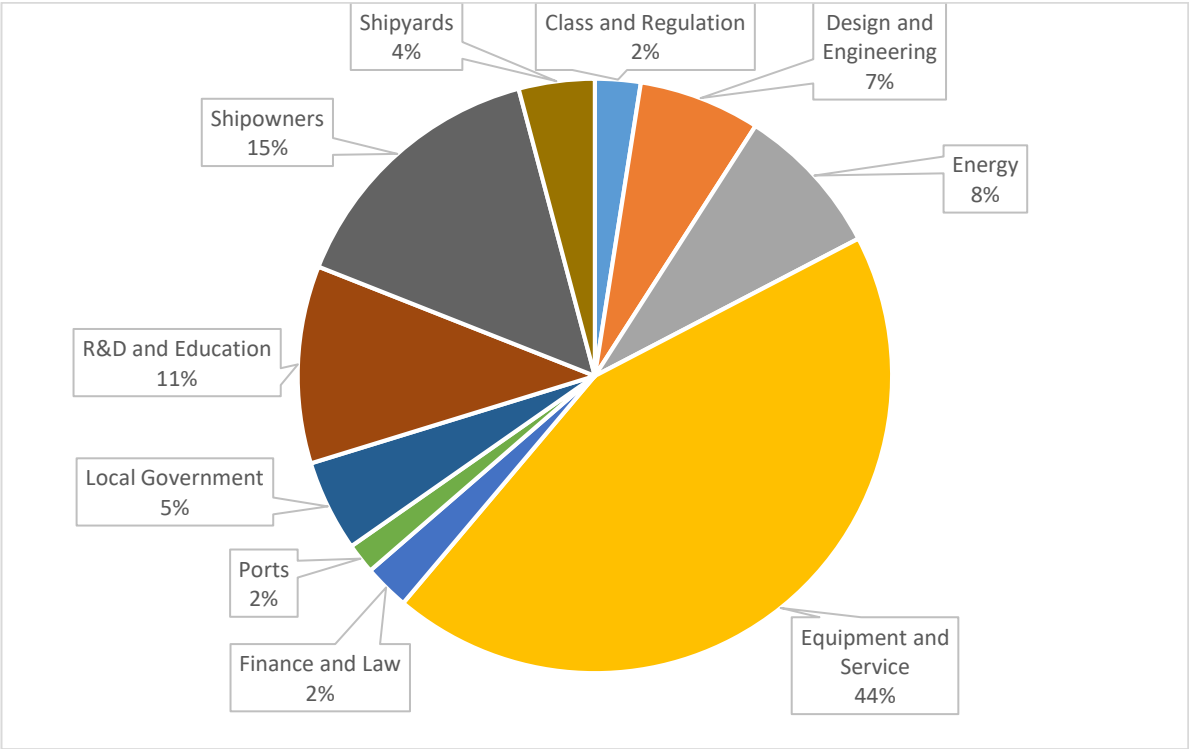

Figure 2.6 NCE Maritime CleanTech Members by Sector
Source: Author, based on NCE Maritime CleanTech (2018

Nearly half of the members (44%) are involved with equipment manufacture, supply and service. Ship-owning companies are the second largest sector (15%), with R&D and educational institutions in third (11%). Tourism and seafood firms are not represented in the cluster.

Funding is drawn from central government as well as member fees. The cluster organisation is of the network administrative organisation type, with a board of directors elected from the membership, and a small administrative team who oversee day-to-day activities.

2.4.6. OceansAdvance

The Canadian maritime industry contributes nearly $32bn (£18.25bn) to GDP and supports 300,000 jobs (Government of Canada, 2021). The contribution of each sector is shown as Figure 2.7.

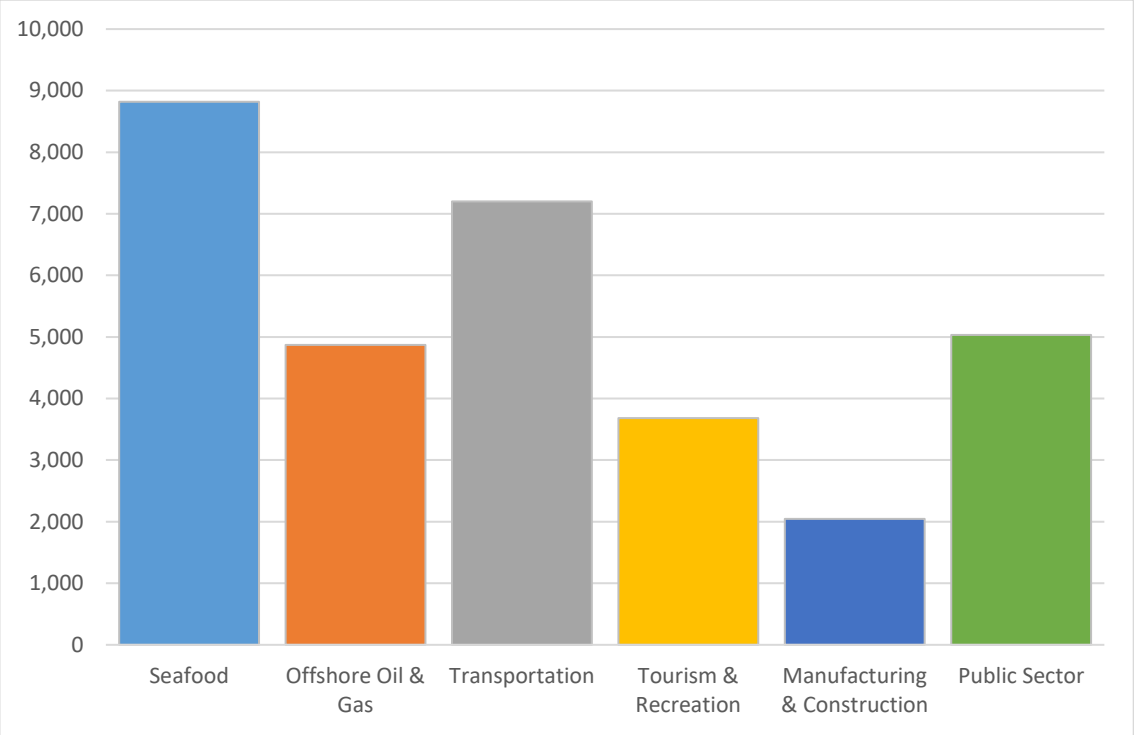

Figure 2.7 Sectoral Contribution to GDP
Source: Author, based on Fisheries and Oceans Canada (2021)

The largest contributor is the seafood sector, accounting for 28% of GDP and is split between commercial fishing (35%), aquaculture (12%), and fish processing (53%). Manufacturing and construction make the least contribution at 6.5% of GDP. The maritime industry in Newfoundland and Labrador accounts for a little over 20% of regional GDP, valued at $6.4bn (£3.65bn); this is the highest proportion in Canada.

OceansAdvance was set up in 2005 by a group from the research, academic, industry and government communities. Its primary goal was to develop a cluster organisation that could bring together regional maritime firms; emphasis today is on innovation, commercialisation and export opportunities (OceansAdvance, 2018a). The cluster concentrates on technology development across aquaculture, defence, education and training, fisheries, ocean science, and

offshore energy, working closely with industry, regional and national government, industry associations, and other regional and national clusters.

Membership of the cluster is from the across the maritime sector, with emphasis on high-tech industries. Research and academic institutions form part of the membership, as do regional and national government bodies.

The cluster organisation is of the network administrative organisation type, with a board of directors drawn from the members, and an administrative team overseeing day-to-day activities. Cluster activities include regular formal meetings, social events, economic development, conferences, youth outreach and training events. Funding is drawn from members, Atlantic Canada Opportunities Agency and Newfoundland and Labrador Tourism, Culture, Industry and Innovation.

2.4.7. Super Yacht Group

The super yacht industry contributes $1.9bn (£1.05bn) to the Australian economy, supporting 14,500 FTE jobs (Superyacht Australia, 2016). The split by region is shown as Figure 2.8.

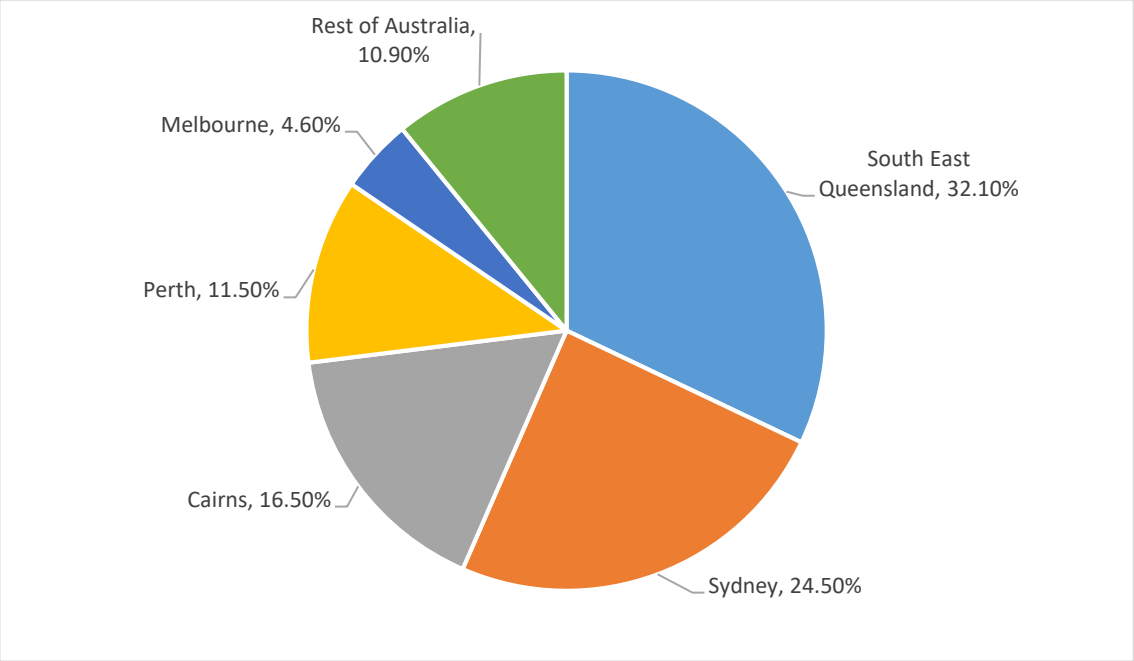

Figure 2.8 Regional Contribution to GDP
Source: Superyacht Australia (2016 p. 25)

South East Queensland is the largest contributor to GDP from the industry, although it is only 0.3% of the Gross Regional Product (GRP). Particular emphasis is on yacht maintenance. The super yacht industry contributes 2.7% of Cairns GRP, making it the highest of any region. Cairns' industry is largely divided between maintenance and tourism.

The Super Yacht Group was formed in 2000 to support the development of the industry in the Cairns region, with particular emphasis on maintenance and tourism. The focus of the Super Yacht Group results in a diverse membership base; this is shown as Figure 2.9.

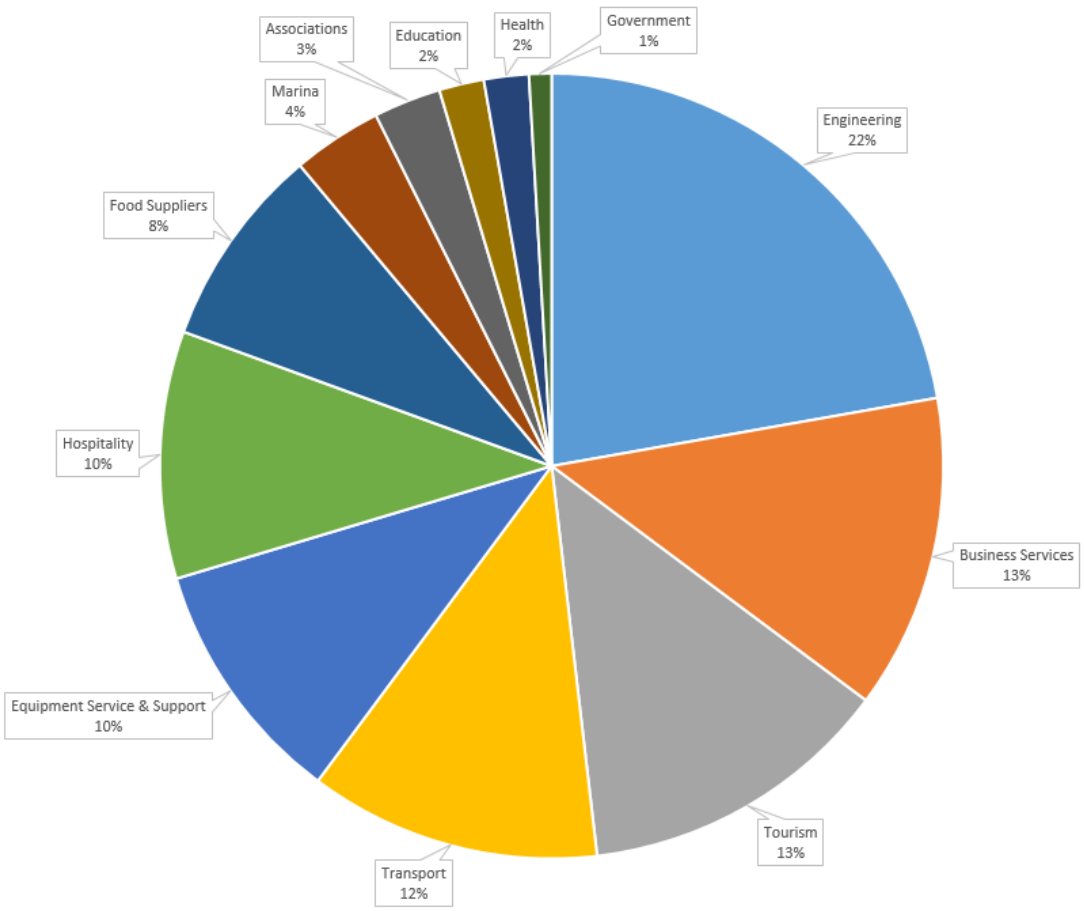

Figure 2.9 Super Yacht Group Members by Sub-Sector
Source: Author, based on Super Yacht Group (2021)

Engineering firms form the single largest sub-sector (22%), followed by business services, and tourism providers (both 13%). Many of the firms within sectors are focused on supporting tourism related to the super yacht industry. The cluster is of the network administrative organisation type, with the board drawn from members, and an administrative team managing day-to-day activities. The cluster organisation acts as a collective voice for the super yacht industry in the region, and as a co-ordinator of activities to support co-operation amongst members. The cluster hosts networking events throughout the year. The cluster is funded from membership fees and from local government.

2.4.8. Swedish Maritime Technology Forum

Statistics Sweden (2018) estimate that in 2015 the maritime industry in Sweden contributed nearly SEK 28bn (£2.37bn) in GVA, directly employing just over 34,000 people. Of those, nearly 13,000 in 2019 were employed in the marine technology industry, with a turnover of SEK 45.5bn (£3.85bn) (Svenskt Marintekniskt Forum, 2021). Cluster development formed part of the 2015 Swedish maritime strategy as a means of fostering a competitive, innovative and sustainable sector (Government Offices of Sweden, 2015).

The Swedish Maritime Technology Forum (SMTF) was established in 2007 as a means of bringing together marine technology firms from across Sweden. Since then, focus has been on business support, and collaboration for innovation and development projects. Cluster activities include formal and informal meetings, research and industry-led seminars, international promotion and educational engagement. Collaborative projects are facilitated, with particular emphasis on small ships technology, a collaboration 'matchmaking' platform, and educational engagement to improve visibility of the industry.

Funding is drawn from Tillväxtverket (the Swedish Agency for Economic and Regional Growth) and the West Gotland regional government, although membership fees are also levied. Since 2017 SMTF have been part of the Research Institutes of Sweden organisation. The cluster organisation is of the network administrative organisation type, with a board of directors drawn from the membership base, and a small administrative team overseeing day-to-day activities of the cluster.

2.4.9. Tasmania Maritime Network

Tasmania has long been a key part of Australia's maritime economy; more ocean-going ships were built in Tasmania in the 19th Century than in the other Australian colonies combined (Department of State Growth, 2020). As a relatively small island state, Tasmanians developed a culture of competitive co-operation; Tasmania now has the highest concentration of researchers and scientists in marine and maritime research. Innovation is recognised as a strength of the maritime economy (Department of State Growth, 2019). Education, training, and workforce development are highlighted as key areas for the maritime sector. Key maritime research institutes are located in Tasmania, including the Australian Maritime College.

The most recent data shows that blue economy maritime industry contributed $71.4bn (£39.47bn) to the Australian economy, representing 4.3% of GDP (Australian Institute of Marine Science, 2018). The shipping industry in Tasmania contributes nearly 10% of Gross State Product.

The Tasmanian Maritime Network (TMN) was formed in 1998 and is the oldest of the nine cluster associations in the study. Their role is to provide strategic direction and business support to Tasmania's maritime industry. Strategic focus is on network promotion, development of relationships and opportunities for collaboration, strengthen industry knowledge and capabilities, and to be the voice of the sector (Tasmania Maritime Network, 2016a).

Members are drawn from across Tasmania, with a membership strategy for new members based around contribution to the industry and TMN, and whether TMN

will be of benefit to the nominee (Tasmania Maritime Network, 2016b). The composition of members is shown as Figure 2.10.

Figure 2.10 Sub-Sector of TMN Members
Source: Author, based on Tasmania Maritime Network (2021)

Engineering firms form the largest sub-sector, making up 33% of member firms, followed by maintenance, service and support firms (18%), research and educational organisations (15%), and ship and boat building firms (12%).

A range of networking events are held, including social gatherings, formal meetings, industry visits and expert speaker sessions. The cluster organisation is of the network administrative organisation type, with a board of directors drawn from the membership base. The cluster is funded from membership fees.

2.5. Conclusion

This chapter introduced and defined maritime clusters, the contribution they make to regional economies and to firm performance. Background information on each of the nine cluster associations used in this research was discussed. The next chapter examines and defines the core constructs in this study.

Chapter 3. Cluster Governance, Social Capital and Sustainable Development: A Review of the Literature.

3.1. Introduction

Chapters 3 and 4 are focused on reviewing relevant literature, and conceptualising constructs and variables. This chapter explores concepts used in this study, confirms definitions and identifies indicators. Chapter 4 then examines linkages and relationships between cluster governance, sustainable development and social capital, before concluding with the conceptual model.

3.2. Clusters

This section provides a detailed review of clusters, starting with their origins in Marshall's industrial districts, before examining the typology of industrial districts developed by Markusen (1996). It considers clusters as business ecosystems, and details key characteristics of regional business ecosystems. From here the section focuses on issues at cluster level, starting with dimensions of clusters that drive performance. Cluster governance is discussed, including the role of cluster organisations. The section concludes with a conceptualisation of cluster governance.

3.2.1. Introducing Clusters

Much contemporary cluster thinking stems from Michael Porter's work of the early 1990s, although principles underpinning clusters stems from Alfred Marshall's 'external economies' in the early 20th Century. 'External economies' are benefits that accrue from related and connected businesses who mutually assist one another (Marshall, 1920). Such businesses were often located in the same area, forming what Marshall termed 'Industrial Districts'. The presence of external

economies in these industrial districts were derived from related businesses circulating ideas and pooling specialised labour (Marshall, 1920; Zhang, 2009).

The mid-20th Century was marked by relative indifference to external economies and industrial districts (Malmberg and Maskell, 2002), with interest re-emerging towards the end of the Century on three fronts. Firstly, research from Sabel (1989 p. 18) described clusters as '*conspicuously successful, twentieth-century variants of industrial districts*' across Europe. Michael Porter identified clusters as being central to a nation's competitive advantage, stating that the '*cluster of competitive industries becomes more than the sum of its parts*' (Porter, 1990 p. 151). Finally studies examining Italian regions found that social capital amongst geographically concentrated firms enhanced performance (Paniccia, 1998).

Defining clusters is somewhat problematic though, with academics unable to reach a position of complete agreement (Richardson, 2010). Definitions are lost in 'semantic ambiguity' (Paniccia, 1998 p. 668), due in part to the term's evolution, variety of cluster structures, and varying application; even names attached to similar structures vary by application (Martin and Sunley, 2003; Maskell and Kebir, 2006). The typology of industrial districts (rather than clusters) proposed by Markusen (1996) provides foundations for contemporary cluster structures, and for understanding governance arrangements within them.

Industrial districts and clusters share similarities, focusing on relationships and interactions amongst agglomerations of related economic activity (Porter and Ketels, 2009). There are also significant differences between the two. Although both have place at their core, focus on industrial districts has been in terms of local development and resilience, whereas the role of the firm and individual

competitive advantage has been prioritised in clusters (Ortega-Colomer, Molina-Morales and de Lucio, 2016). Geographic proximity often differs; industrial district literature typically focuses on localised agglomerations, whereas Porter (1998) suggests that clusters can cross local, regional and national boundaries. Porter and Ketels (2009) argue that industrial districts are typically characterised by co-located agglomerations of SMEs, as opposed to clusters which have a much broader range of configurations. Economic success is argued to be an outcome of social cohesion in industrial districts, whereas in clusters, social factors result from firm-level success (Ortega-Colomer, Molina-Morales and de Lucio, 2016).

Whilst clusters and industrial districts are different concepts, there are similarities at a structural level. As a result the next section offers a typology of industrial districts as a way of explaining cluster structures.

3.2.2. Typology of Industrial Districts

The economic geography literature offers many differing, but related terms to describe geographical arrangements of business; see Martin and Sunley (2003) for many such examples. Porter's (1998 pp. 197-198) definition that clusters are *"geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions in particular fields that compete but also co-operate…"* is one of the more widely cited, but remains broad (Reinau and Dalum, 2008), and does not adequately convey a variety of structures that can emerge. This poses challenges, both to policymakers (what is actually to be developed?), and researchers, especially when considering governance.

Cluster governance is affected by issues of structure and composition. Mutual dependencies mean that all associated with the cluster have a role to play in developing cluster strategies (Porter, 1998a). Each stakeholder brings with them *"preferences (i.e. motivations/expectations), interests and needs, as well as commitments, responsibilities, timetables, capabilities and (im)material positions"* (Ebbekink, 2017 p. 622). These differences, together with relative power, can all influence cluster strategy, development, operation, how voices are heard, and how different actors develop and maintain relationships.

Whilst many authors have sought to construct typologies of clusters and/or industrial districts since, both in general terms (Brenner, 2000; Iammarino and McCann, 2006; Pickernell et al., 2007), and within industries specifically (Picard, 2008; He and Fallah, 2011; Boix, Hervás-Oliver and De Miguel-Molina, 2015; Koliousis et al., 2017), few have achieved such significance and applicability to empirical research of Markusen's work (Reinau and Dalum, 2008).

Building on Marshall's concept of industrial districts, and associated 'new industrial districts', Markusen (1996) proposed three further models that demonstrated economic resilience in regional economies of Japan, Korea, USA and the Third Italy. Third Italy refers to the growth of central/north-eastern Italy during the 1970s; this period was dominated by territorial organisation characterised by family entrepreneurship, small industries and social cohesion (Bartolini, 2021).

This typology was based on a number of features from the new industrial district literature, with emphasis on: firm size distribution, upstream and downstream linkages, innovative capabilities and organisation of production, and from areas

historically excluded, i.e. the role of the state and large firms, embeddedness of firms in local and non-local networks, resilience of firms within regions, and socio-economic factors.

The models of industrial district within Markusen's (1996) typology are Marshallian (including Italianate variant, linked to the Third Italy), hub-and-spoke, state-anchored, and satellite platform district. Marshallian districts are characterised by many small, locally owned firms, who enjoy significant trade with each other, and who typically do not engage in extra-regional co-operation. The Italianate variant is similar, but typically involves greater co-ordination between members and business associations. Hub-and-spoke and state-anchored districts are similar in structure, with a core anchor entity and smaller, related firms linked at the periphery. The fundamental difference is the nature of the anchor entity, with those in hub-and-spoke districts being private firms, whilst those in state-anchored districts are state-owned bodies. Satellite platform districts are dominated by large, externally-owned firms, with little intra-district trade, or commitment to regional suppliers (Markusen, 1996).

These are represented in Figure 3.1 and examined in sections 3.2.2.1-3.2.2.4. The state-anchored district is not shown but shares a similar structure to hub-and-spoke districts.

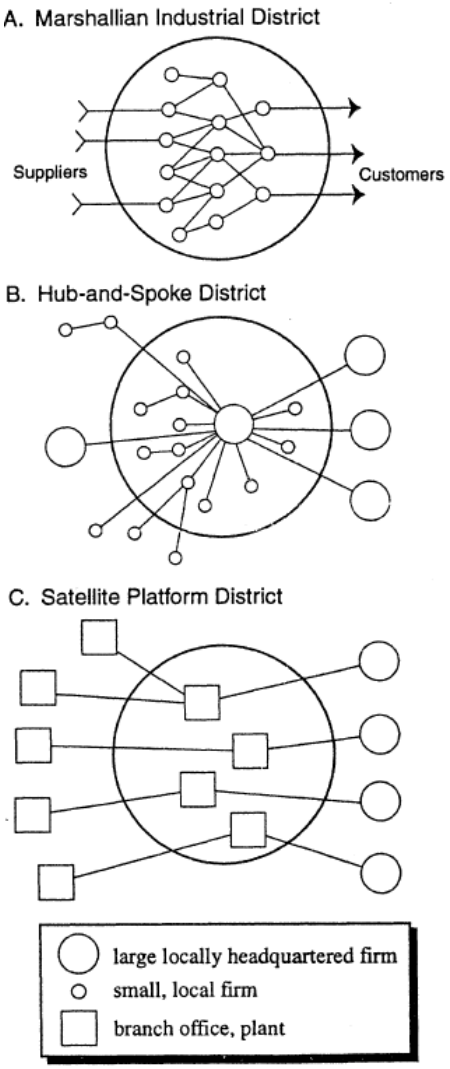

Figure 3.1 Typology of Industrial Districts
Source: Markusen (1996 p. 297)

One criticism of Markusen's typology is that whilst there is a strong theoretical footing, such districts exist in reality, forming part of "*complex networks of localities"* (Reinau and Dalum, 2008 p. 15), meaning that decisions by firms and other organisations outside their locality can impact on district development. This is noted by Markusen (1996) who recognised that regions often have elements of all four models present. Markusen (1996) also linked power within industrial districts to company size. Whilst size is a factor in power-relationships, other

factors are influential, such as smaller groupings seeking strategies of their own (Reinau and Dalum, 2008).

3.2.2.1. Marshallian and Italianate

Industrial districts played a significant role in Marshall's thinking around the turn of the 20th Century, referring to a region where industry has settled, but extending beyond a simple 'localised industry' (Belussi and Caldari, 2009). Whilst a localised industry refers to geographical concentrations of firms, in a manner similar to industrial districts, it is typically due to either ease of access to resources they require, or ease of access to buyers (Marshall, 1920). This contrasts with more settled industrial districts; localised industries can become industrial districts over time, each developing a number of advantages and characteristics. These advantages and characteristics are shown as Table 3.1.

Characteristic	Description
Hereditary Skills	Particular skills are passed down through generations; reinforcing characteristics of concentrated trade.
Growth of Subsidiary Trades	Range of suppliers develop to support the core industry.
Use of Specialist Machinery	High division of labour and specialisation resulting from significant volumes of similar production.
Local Market for Skills	Localised industries provide a local job market, with relative ease of seeking jobs, and employers seeking workers.
Industrial Leadership	Derived from the industrial atmosphere and described as “the power of doing now what others will presently be doing, or at all events trying to do” (Marshall, 1919 p. 27)
Innovation	Sharing of good ideas facilitated by strong local social networks.
Competitive and Co-operative	Firms within districts co-operate vertically, or through associations, but remain competitive.
Unique Cultural Identity	Workers are committed to the district, rather than firm, with local identity and bonds strong.

Table 3.1 Advantages and Characteristics of Marshall’s Industrial Districts
Source: Author, based on Marshall (1920), Markusen (1996) and Belussi and Caldari (2009)

These characteristics contribute to developing the atmosphere of the district which is essential for the growth of districts and firms. This is driven by formal and informal relationships, rules, customs and norms. A unique cultural identity is a key feature of the Marshallian industrial district; it is the relative sociocultural homogeneity, termed ‘communitarian factor’ that contributes to a reduction in transaction costs and development of relationships (De Marchi and Grandinetti, 2014). Confidence grows as uncertainty is reduced, resulting in greater flexibility and competitive advantage (Corolleur and Courlet, 2003; Belussi and Caldari, 2009).

Associations can develop within districts to co-ordinate co-operation, with Belussi and Caldari (2009) citing examples such as the Manchester Cotton Association

and British Pottery Manufacturer's Association who sought to provide regulation for the conduct of trade; standards; creation of markets; greater co-operation and joint marketing. These associations tended towards more centralised control and co-ordination in order to realise benefits (Marshall, 1919). This approach has similarities with contemporary cluster organisations, whose role includes establishing relationships and co-ordinating activities to enhance competitive advantage (Burger, Karreman and van Eenennaam, 2015); there is greater discussion of cluster organisations in section 3.2.4.2.

a) Italianate

Markusen (1996) highlights significant evolution from Marshallian industrial districts, whereby firms within the Italian case placed greater emphasis on territorial organisation (Bartolini, 2021) and conscious networking; collective strategic planning; shared infrastructure, such as marketing, training and technical support, that is provided by trade associations; and greater exchange of personnel. Local and/or regional governments contribute to promoting core industries.

3.2.2.2. Hub-and-Spoke

Key, or anchor, firms form the basis of hub-and-spoke industrial districts. As can be seen in Figure 3.1, anchor firms sit in the centre of the district, with interconnected and inter-related firms and institutions (Porter, 1998), distributed towards the periphery. Anchor firms are generally dominant with smaller related firms dependent upon them. Along with single anchor firms, Markusen (1996) describes hub-and-spoke structures where anchor firms are one of a limited number that dominate a single industry.

There are similarities between hub-and-spoke and Marshallian districts: a local cultural identity can emerge, along with a strong local market for skills, and growth of subsidiary trades, although unlike in Marshallian districts, control and co-ordination generally sits with the anchor firm, with district fortunes dependent upon their success or failure (Garavaglia, 2018).

3.2.2.3. State Anchored

State anchored districts typically reflect the hub-and-spoke model, albeit with a fundamental difference: the anchor entity. Whereas in hub-and-spoke models, the anchor entity is typically one or a few major firms, anchor entities in state anchored models are public or non-profit organisation (Markusen, 1996). Like the hub-and-spoke model, prosperity of state anchored regions depend on anchor entities, both in terms of their own success, but also in generating new businesses, local suppliers and local labour markets. Control and co-ordination tend to be high, especially where supply relationships are involved.

3.2.2.4. Satellite Platform

Markusen (1996) defines satellite platforms as congregations of divisions of externally owned and headquartered firms. As can be seen in Figure 3.1, branches are largely independent, typically unrelated (and can range from simple assembly to leading-edge R&D), and often standalone, both from co-located firms and from parent organisations. Firms within satellite platforms are usually heterogeneous, with little collaboration or even communication.

Unlike types discussed in previous sections, satellite platforms are almost always induced by industrial policy (Hobbs, Moloney and Walsh, 2010) and typically located away from significant urban areas (Markusen, 1996). The often unrelated

nature of firms can result in an absence of networks and relationships (Amaral et al., 2017). A notable exception can be found in relationships with R&D institutes, but these are often to meet particular firm-level needs (Arikan and Schilling, 2011). The absence of regional networks results in little scope or need for activities to be co-ordinated.

It is argued that given a number of constraints satellite platforms generally lack the ability to develop into a regional economy: their diversity, a strength but also a weakness, can result in minimal opportunity for trade associations to grow; key sources of finance and expertise are external to the region; their heterogeneity does not engender shared cultural identity; finally location can become a barrier to recruiting labour (Van Egeraat and Curran, 2013).

3.2.2.5. Centralisation and Co-ordination in Industrial Districts

Dei Ottati (1994) argues that the relationship between co-ordination and control distinguishes industrial districts as models of organisation. Centralisation of control and need for co-ordination amongst district actors can vary quite significantly within those structures and can influence interactions and relationships. This section examines co-ordination and centralisation of control in greater depth and contributes to discussion of governance (section 3.2.4) and cluster organisations (section 3.2.4.2).

a) Centralisation of Control

Centralisation of control refers to the extent to which an organisation can influence interactions within the district and is argued to be driven by two key factors: architectural control, and high minimum efficient scale (Arikan and Schilling, 2011). The former refers to the ability of one (or a few) firms to control the overall economic structure of the district. This is often found in hub-and-spoke

districts where the hub firm has significant control over behaviour of others, and where a few firms dominate, such as the UK ceramics industry towards the end of the 20th Century (Hervas-Oliver, Jackson and Tomlinson, 2011).

The minimum efficient scale is the optimal level of production output for a firm (Greer, 2012); a firm with a high minimum efficient scale within a value chain will typically be large, and able to exert control over suppliers within a region.

b) Need for Co-ordination

Co-location does not always mean that firms will co-operate; some can do so as an outcome of market forces without any overt or planned interventions. Arikan and Schilling (2011) highlight two key factors that drive the need for co-ordination; complexity and imperfect separability. Complexity can be product-related or environment-driven: the former requires firms to exhibit high levels of co-ordination amongst their supply chain in order to produce highly complex products; environment-driven complexity refers to changing demand characteristics of customers and can extend to changing demands of a region.

Imperfect separability is defined as the interdependence of firms; firms can undertake economic activity separately, but only with effective co-ordination. This need can reduce barriers to collaboration between firms.

Districts which exhibit low centralisation of control and low need for co-ordination are likened by Arikan and Schilling (2011) to Marshallian industrial districts. No one firm holds significant control over others; whilst firms benefit from demand externalities, there is little regional co-ordination. The Italianate variant is similar to Marshallian districts in that no one firm holds significant market power or control, but with more conscious efforts in networking and co-ordination, typically

by external agents, such as the state. Hub-and-spoke and state anchored districts exhibit higher levels of co-ordination and control, with anchor entities having significant influence over other firms. Satellite platform districts tend to have lower co-ordination as firms typically have minimal interaction; there is high centralisation of control, normally by a central governing body in attempts to develop positive externalities. Table 3.2 provides a summary of the typology linking it to factors of centralisation and co-ordination.

	Low need for co-ordination Low centralisation of control	High need for co-ordination Low centralisation of control	High need for co-ordination High centralisation of control	Low need for co-ordination High centralisation of control
Relationship to Markusen's (1996) Typology	Marshallian	Italianate Variant	Hub-and-Spoke; State Anchored	Satellite Platforms
Structure	Many SMEs; no single firm holds significant market power.	Combination of SMEs and large firms; no single firm holds significant market power.	One or several vertically integrated hub firms surrounded by small specialised suppliers	Combination of SMEs and large firms; often branches of large firms headquartered outside district.
Nature of Relationships between Firms in District	Primarily transact within district; few firms sell to outside buyers. Predominance of vertical contracts between buyers and sellers.	Primarily transact within district; firms can sell to outside buyers. Vertical and horizontal relationships.	Hub transacts globally; suppliers rely on business from hub. Vertical contracts; arms-length relationship with most suppliers; some relationships can be more co-operative.	Minimal interaction between entities in district.
Benefits of Locating within District	Labour; supply; knowledge; demand externalities.	Labour; supply; knowledge; demand externalities; knowledge creation; flexible specialisation advantages.	Labour and knowledge externalities; lower transportation and transaction costs.	Pecuniary externalities such as tax benefits, research grants; higher knowledge spillovers and frequency of collaboration with research institutes.
Costs of Locating within District	Increased competition due to co-location.	Increased competition due to co-location.	Increased competition due to co-location; potential abuse by hub.	Friction between governing body and tenant firms; potential disconnect between corporate policies and those of governing body; higher labour costs.

Table 3.2 Summary of Characteristics of Industrial District Type
Source: Author, based on Arikan and Schilling (2011 pp. 778-782)

These four industrial district types are examined in the context of governance later (section 0). In summary, the second of the industrial district types shown in Table 3.2 (high need for co-ordination/low centralisation of control), linked to the Italianate variant of Marshall's industrial districts fits with the cluster organisation model at the core of this research. The next section examines clusters as business ecosystems.

3.2.3. Clusters as Business Ecosystems

Business ecosystems are structures whereby "*interdependent complementary actors co-operate, compete and co-evolve capabilities around a new innovation in the global market, all in order to achieve a global competitive advantage"* (Aksenova et al., 2019 p. 318). Business ecosystems provide a system architecture which fosters innovation, and includes firms and supporting institutions (Mercan and Göktaş, 2011). Symbiotic relationships that emerge in business ecosystems can be viewed as foundations of survival and growth, where firms are interdependent and interrelated, sharing common goals (Lee, Moon and Yin, 2020).

Although the extent of their success as business ecosystems is debated, clusters are argued to be drivers of growth and innovation (Delgado, Porter and Stern, 2010, 2016), with general aims of enhancing business performance and creation of value (Wise, Wilson and Smith, 2017). In terms of increased business performance, Porter (2001) identified greater innovation and enhanced productivity as being two core aspects, with wider employment and GDP benefits attached. These are summarised in Table 3.3 with distinction made between impacts of clustering generally and the impacts of specific cluster policies. It is argued that clusters exist across all levels of economic development; whilst they

have become a common choice for economic development policymakers, they should be viewed as complementary to existing regional and sectoral strengths (Lindqvist, Ketels and Sölvell, 2013).

	Impacts of Clustering	**Impacts of Cluster Policy**
Innovation in Firms	Positive impact	Significant evidence of positive impact on firm-level innovation
Productivity of Firms	Positive impact	Some evidence of positive impact on firm-level productivity
Employment in Firms	Positive impact, but with limited evidence	No significant evidence of impact on firm-level employment
Regional Development	Some evidence of positive impact on wages and employment growth	Evidence of impact on regional GDP growth, new ventures/entrepreneurial activity, and resilience

Table 3.3 Impacts of Clustering and Cluster Policy
Source: Wise, Wilson and Smith, (2017 p. 10)

Empirical analysis of cluster objectives in Croatia established six key roles clusters play in enhancing regional growth and business performance. These form the basis of cluster management, and are shown in Table 3.4.

Dimension of Cluster Role	Specific Activity
Lobbying	Lobby government for infrastructure
	Lobby for subsidies
	Improve Foreign Direct Investment (FDI) incentives
	Improve regulatory policy
Innovation	Facilitate higher innovativeness
	Attract new firms and talent to sector/industry
	Create brand for sector/industry
	Enhance production processes
	Diffuse technology within cluster/sector
Market and Sector Analyses	Assemble market intelligence
	Analyse technical trends
	Provide business assistance
	Study and analyse sector
Infrastructure and Standards	Conduct private infrastructure projects
	Establish technical standards
	Co-ordinate purchasing
	Provide incubator services
Networks and Collaboration	Foster networks among people
	Establish networks among firms
Training	Provide technical training
	Provide management training

Table 3.4 Cluster Roles
Source: Author, based on Anić et al., (2019)

Lee, Moon and Yin (2020) highlight co-operative and competitive aspects of business ecosystems, along with the interconnected and interrelated nature of heterogeneous firms with diverse capabilities, as important parts of innovation processes. Key drivers of these impacts are considered in the following four sub-sections.

3.2.3.1. Agglomeration and Proximity

Agglomeration economies are a much broader concept than clusters as they refer to all forms of spatial collocation, rather than the linkages experienced in clusters (Belussi, 2006; Malmberg and Maskell, 2010). Regardless of the nature of the linkages, it is argued that firms, and workers, are significantly more productive and innovative in dense environments (Puga, 2010). This increase in productivity and innovation can be attributed to three key agglomeration effects, identified by

de Langen (2004) as; a shared labour market, presence of suppliers and customers, and knowledge spillovers.

There is a significant body of literature examining the relationship between clusters and innovation across a broad range of industries (Nooteboom, 1999; Carbonara, 2004; Gordon and McCann, 2005; Rialland, 2009; Chapain et al., 2010; Rodríguez-Pose and Comptour, 2012; van Aswegen and Retief, 2020). It is argued that fostering of innovation takes place as geographically proximate firms have a greater ability to identify opportunities, and work with suppliers, customers and research bodies to develop ideas into reality (Porter, 2001). This reinforces links between cluster and business ecosystem; Lee's (2019) model of co-operation for innovation in business ecosystems highlights a process of co-existence, co-learning, co-production and co-evolution. This link to connectedness, strategic fit, and collaboration fits well with the cluster model.

Whilst clusters can contribute to the realisation of such benefits, emphasis on geographical proximity is not always substantiated and does not necessarily determine success in a firm or industry (Martin and Sunley, 2003). More recently, Rodríguez-Pose and Comptour (2012) argued that growth often requires favourable underlying socioeconomic factors; extra-regional linkages have also been identified as having importance (Tomlinson and Jackson, 2013; Byrne, Hobbs and Doran, 2018; Barzotto et al., 2019).

3.2.3.2. Competition

"Competition is a good thing; it makes markets work well, and is in society's interests" (Davies et al., 2004 p. 1). There is a distinction between internal

competition (competition taking place between firms within the same cluster) and external competition (competition with firms outside the cluster).

Porter (1990) refers to internal competition as a means of furthering cluster dynamism. Building on this, de Langen (2004) proposes three arguments in support of Porter's position: internal competition acts to reduce switching costs, enhances specialisation amongst firms and, closely aligned with Porter's (1990) creates a 'vibrant environment'. As a result, internal competition can act to enhance cluster performance.

Whilst competition is typically seen as being positive, some types of competition are negative, and typically involve a drive towards lower prices.

3.2.3.3. Co-operation

There is a clear link between co-operation and performance in the cluster literature (Schmitz, 2000). Co-operation can occur amongst firms vertically and horizontally. Vertical co-operation exists between customers and suppliers throughout supply chains, typically taking the form of closer integration of processes. Horizontal co-operation is sometimes referred to as "co-opetition", and refers to shared and collaborative working between firms who traditionally compete with each other and is typically linked to value creation (Bailey, Pitelis and Tomlinson, 2019).

Linked to negative aspects of competition, there are forms of co-operation that are viewed as destructive such as the (illegal) restriction of competition linked to price-dominated strategies. Potential for trust and collaborative relationships can also diminish in the face of reduced competitive advantage (Newlands, 2003).

3.2.3.4. Heterogeneity

Clusters that are more heterogeneous in nature will perform 'better' than more homogeneous ones (de Langen, 2004). Håkansson & Olsen (2011) suggest that innovation within clusters is linked to activities and interaction of a number of actors, including universities, firms, suppliers and financial institutions within the cluster (Corsaro, Cantù and Tunisini, 2012). Heterogeneous composition of firms and their inter-relationships have been shown to affect performance (Giuliani, 2006). von Ehrlich & Seidel (2013) demonstrate that with regard to total factor productivity, i.e. " *portion of output not explained by the amount of inputs used in production*" (Comin, 2006 p. 1), heterogeneity of firms is a driver of agglomeration. Indeed, von Ehrlich & Seidel (2013) argue that greater homogeneity go on to state that 'if firms are more similar to each other in terms of productivity, tendency for full agglomeration is weaker.'

de Langen (2004) suggests numerous ways of defining firm heterogeneity, but offers three relatively straightforward approaches – economic activity, linked to von Ehrlich & Seidel (2013) above, firm size and international scope. The nature of firms' production is also a factor as firms engaged in different activities within a cluster make clusters more likely to withstand shocks.

Whilst the literature generally supports heterogeneity within clusters as a positive factor, clusters with an inefficient composition of firms can have a negative effect on growth. This is due to differences in productivity in firms that make up clusters. Less productive firms will find being part of clusters relatively more beneficial than more productive firms. The net effect of this composition is that overall productivity in the region is reduced, thus lowering the overall level of efficiency

of the economy. Origins of this argument are found in Melitz (2003) and supported by Baldwin & Okubo (2005).

In summary, clusters are regional, industry-specific business ecosystems; they are influenced by proximity, relatedness, competition and cooperation and composition that is generally heterogeneous. Having examined factors that influence clusters competitiveness, this chapter moves on to consider dimensions of cluster policy that should be developed.

3.2.4. Cluster Governance

Whilst cluster governance is critical to the success of the cluster, it is an area that has historically been overlooked in the literature (De Propris and Wei, 2007; Berthinier-Poncet, 2014). Focus in this area has grown in recent years, but remains somewhat under-developed (Tomlinson and Branston, 2018).

Governance has been defined as "the *entirety of institutions which coordinate or regulate action or transactions among subjects within a system*", and includes a variety of actors, including, for example, firm, state, trade unions, and market as a whole (Le Gales and Voelzkow, 2001, pp. 6–7, cited in Sacchetti and Tomlinson, 2009). Whilst each of these, as highlighted by Sacchetti and Tomlinson (2009) are of significance to overall governance processes within regions, this research focuses on inter-firm relationships promoted by the cluster organisation. Cluster organisations are discussed in section 3.2.4.2. This section continues with an overview of governance, leading to the definition of cluster governance used in this study.

Early focus of corporate governance was on the distribution of power within firms, although a separate form of governance, that of network governance, emerged

in parallel (De Propris and Wei, 2007). This focus on network governance is critical as firms tend not to undertake strategic and/or operational planning completely divorced from the environment in which they operate (Sacchetti and Tomlinson, 2009). With emphasis on co-ordination and regulation of activity within clusters, cluster governance has implications for overall cluster.

Governance within clusters relates to internal mechanisms that drive patterns of desirable behaviour amongst its members, including co-operation; collaboration; and knowledge exchange (Cassanego Júnior et al., 2019). Cluster governance studies highlight the role it plays in cluster performance, typically in terms of competitiveness and innovation (Parrilli and Sacchetti, 2008; Cabanelas et al., 2017).

Zaccarelli et al., (2008 p. 52, cited in (Cassanego Júnior et al., 2019) provide a definition of cluster governance as "*supra-enterprise governance* [constituting] the *strategic influence exercised by supra-enterprise entities, geared towards system vitality, composing competitiveness and aggregate result and affecting all of the organizations comprising the supra-enterprise system.*"

In trying to facilitate particular policy objectives, cluster governance is defined in this research as the 'strategic mechanisms by which clusters operate and member firms work towards system vitality', and narrowed to a number of focal points: governance as co-ordination of relationships between firms to ensure effective co-operation (Sacchetti and Tomlinson, 2009; Saggese, 2016); governance as regulation and control, providing a framework of shared rules, policies and practices (De Propris and Wei, 2007); and governance as a facilitator of knowledge management (Berthinier-Poncet, 2014). Saggese (2016) adds a

fourth dimension; that of governance as an enabler of shared, strategic, long-term decision-making.

In assessing governance, De Propris and Wei (2007) argue that the assumption that governance is dispersed across network members, rather than within one of the differing forms of governance is a key limitation. Governance within networks typically takes place along a spectrum, ranging from hierarchical to heterarchical. This links with networks of direction (hierarchical) and networks of mutual dependence (heterarchical) proposed by Sacchetti and Sugden (2003), and the three forms of network governance proposed by Provan and Kenis (2008): participant-governed networks (heterarchical); lead organisation-governed networks and network administrative organisations (hierarchical).

3.2.4.1. Governance Structures

Governance structures within an industrial district or cluster will influence power relationships, the nature of decisions made by firms, and their subsequent interactions (Sacchetti and Sugden, 2003).

This section examines governance structures starting with discussion of hierarchical and heterarchical approaches to governance, then considers structures of network governance observed by Provan and Kenis (2008). The section finishes with a summary bringing together these aspects with Markusen's (1996) typology of industrial districts.

a) Heterarchical and Hierarchical Approaches

Heterarchical governance structures are typically flatter than hierarchical ones, and are largely based around socio-economic relationships between firms in a region who are interdependent and inter-related (Tomlinson and Branston, 2018).

Governance structures that are heterarchical in nature are more likely to encourage participation and engagement between network firms, enabling discussion and debate in guiding issues of long-term local development; indeed higher levels of participation are argued to be important in developing a shared vision for districts (or clusters) (Dei Ottati, 2003, cited in Tomlinson and Branston, 2018). Marshallian and Italianate variants of industrial district exhibit characteristics of heterarchical governance structures, exhibiting low centralisation of control, with low-high need for co-ordination (Arikan and Schilling, 2011).

Hierarchical structures are characterised by one, or a few firms who have relative economic and strategic dominance over others (Sacchetti and Sugden, 2003). Such structures are more typical of Markusen's (1996) hub-and-spoke and state-anchored industrial districts. Power is centrally located with anchor entities who hold considerable control over local suppliers. There is high co-ordination to ensure competitive advantage is retained; relative district success depends on the strategies and performance of anchor entity (Carbonara, 2002). Inter-firm relationships will often depend on anchor entity strategies, ranging from strong competition to more co-operative and knowledge sharing relationships (Arikan and Schilling, 2011).

b) Structures of Network Governance

In determining a typology of network governance, Provan and Kenis (2008) drew on two key factors; the first refers to network brokerage, whilst the second is linked to whether the network is participant governed or not. This is summarised as

Figure 3.2.

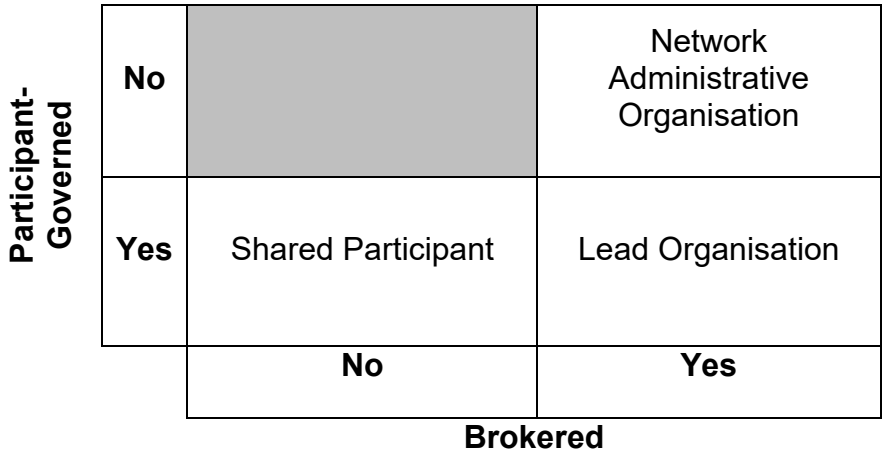

Figure 3.2 Types of Governance Structure
Source: Author, based on (Provan and Kenis, 2008)

Networks that are brokered are more centralised in nature, i.e. have an organisation leading network strategy, objectives and co-ordination. They typically take on one of two forms; either lead organisation, where a network member takes on the role of broker, or a network administrative organisation whereby an organisation is established as a separate entity to take on the governance role. Whilst being a separate entity, the leadership board of the latter is often comprised of representatives from member firms, e.g. the Board of Directors of the Cornwall Marine Network has representation from a range of member firms, see Cornwall Marine Network (2019).

Non-brokered, participant-governed networks are more decentralised, and involve decision-making by members without a separate governing body overseeing strategy and co-ordination. Provan and Kenis (2008) suggest that all members in this type of network contribute more to governance processes and is typical of much smaller networks.

This section has considered governance structures as heterarchical and hierarchical systems, as well as structures resulting from the perspective of

control. Table 3.5 summarises these points, along with the relationship to Markusen's (1996) typology and resulting predominant form of governance within each.

	Low need for co-ordination Low centralisation of control	**High need for co-ordination Low centralisation of control**	**High need for co-ordination High centralisation of control**	**Low need for co-ordination High centralisation of control**
Relationship to Markusen's (1996) Typology	Marshallian	Italianate Variant	Hub-and-Spoke; State Anchored	Satellite Platforms
Relationship to Provan and Kenis' (2008) Network Governance Forms	Shared Governance	Shared Governance / Network Administrative Organisation	Lead Organisation	Lead Organisation / Network Administrative Organisation
Structural Form	Heterarchical	Heterarchical	Hierarchical	Typically hierarchical
Predominant Form of Governance	Arm's length market exchanges; no co-operation between member firms beyond what can be considered as their economic interest in atomised competitive environment.	Geographically bounded network organisation; strong norms of co-operation and social exchange.	Hierarchical governance by hub; supplier behaviour regulated by structures and sanctions put in place by the hub.	Hierarchical governance by district sponsor.

Table 3.5 Relationship between Typologies of Industrial District and Forms of Governance
Source: Author, based on Markusen (1996); Provan and Kenis (2008); Arikan and Schilling (2011)

This part has considered varying governance arrangements within industrial districts, and argues that MCOs that form the basis of this research is considered as akin to Italianate versions of Marshallian industrial districts, requiring a relatively high need for co-ordination, but with low centralisation of control (Arikan and Schilling, 2011), resulting in a network administrative organisation form of governance (Provan and Kenis, 2008). By framing discussion within this context, it is possible to narrow the scope to only those issues that are pertinent to network administrative organisation forms of cluster governance.

In order to avoid any confusion between terms, it is at this point that the terms 'industrial district' and 'network administrative organisation' are dropped in favour of cluster organisation. This chapter moves on to consider the nature, structure and management of cluster organisations, before examining the dimensions of governance used in this research, and the impact governance can have on cluster and firm performance.

3.2.4.2. Cluster Organisations

Cluster organisations were defined in chapter one as *"legal entities that support the strengthening of collaboration, networking and learning in innovation clusters and act as innovation support providers by providing or channelling specialised and customised business support services to stimulate innovation activities, especially in SMEs*" (European Cluster Collaboration Platform, 2020 para. 2).

Cluster organisations are 'connective tissue' in the development and success of clusters. They play a key, multi-faceted role; on one hand they develop strategic plans and direction to improve a cluster's business environment, whilst on the other they facilitate activities designed to increase cluster competitiveness, along

with reducing geographical and cognitive proximity (Glaser, 2013; Ketels, 2015; Karreman, Burger and van Eenennaam, 2019). Typical activities include: initiation of projects from actors across the triple helix of industry, academia and government; lobbying government to meet regional and sectoral needs; increasing the external visibility of the cluster; arrange matchmaking and networking events; disseminate business intelligence; and promulgate business opportunities (Burger, Karreman and van Eenennaam, 2015; European Commission, 2020). Ketels (2015) states that cluster organisations can also support specific sustainability policy actions.

Whilst cluster organisations share a number of similarities with sector associations, particularly with regard to enhancing firm performance and industry representation, there are notable differences; sector associations focus on particular sectors, whereas firms across many sectors are members of cluster associations. Many sector associations are members of cluster organisations, providing technical support and training, whereas cluster organisations place greater emphasis on innovation, R&D, and competitiveness (Policy Research Corporation, 2008)

As a result, those appointed to administer clusters take on an important role in cluster development. The role of cluster managers extends beyond the management of the cluster organisation itself (PWC, 2011) with Frankowska (2020) arguing that they are key bridging entities between cluster firms. Their role is to develop the strategic cluster framework, facilitate network activities and ensure effective cluster governance.

The governance role is multi-dimensional, requiring significant work in key areas: effectiveness and clarity of purpose, including membership strategy and stakeholder contribution to cluster strategy; accountability to stakeholders; transparency in cluster performance; efficiency of cluster management; demonstrating benefits of firms' investment; responsiveness to stakeholder needs; fostering inclusiveness and participation of members; and reaching consensus amongst stakeholders (PWC, 2011). These areas are linked to the dimensions of governance examined in the next section.

With cluster organisations typically having a membership base drawn from a wide range of organisations and a broad set of stakeholders across the quadruple helix of industry, government, academia and civil society (Hasche, Höglund and Linton, 2020), cluster managers have to ensure a range of voices are heard.

There is debate as to the effectiveness of cluster organisations in delivering cluster benefits; a review of the literature found cluster organisations delivering positive impacts for firms, but also those that demonstrated little positive effect on firms and/or regions (Ketels, 2015). More recent studies have indicated similar findings: Žižka et al., (2018) argue that cluster organisations have a significant effect on improved innovation performance in traditional industries; yet in a different area of cluster strategy, the effect of cluster organisations in attracting FDI was found to be weak in the life sciences industry (Burger, Karreman and van Eenennaam, 2015). Despite this lack of consensus, cluster organisations remain key components of cluster policy, with several thousand cluster organisations in existence globally.

Lindqvist, Ketels and Sölvell (2013 p. 12) suggest that poor performance generally is attributed to "*poor consensus, weak frameworks, facilitators lacking strong networks, lack of offices and sufficient budgets, and neglected brand building.*" Effective cluster governance can contribute to overcoming those pitfalls. The next section examines the three dimensions of cluster governance.

3.2.4.3. Dimensions of Cluster Governance

This study used three dimensions of cluster governance proposed by Berthinier-Poncet (2014) as the model of cluster governance. This section examines these three dimensions – normative, cognitive, and political – and their associated sub-dimensions.

a) Normative Governance

Normative cluster governance refers to strategic actions taken to develop trust, shared identity and collective cluster goals (Eisingerich, Bell and Tracey, 2010). Furthermore, normative processes seek to develop and sustain relationships between cluster members.

The emergence of cluster organisations saw them linked with particular economic policy objectives, including: increased microeconomic focus; emphasis on local and regional areas; improved networking amongst clustered firms; and collaboration as a driver of learning and innovation (Solvell, Lindqvist and Ketels, 2003). As a result of these policy drivers, cluster organisations take on a more strategic view of cluster performance and development.

With cluster organisations taking on this strategic focus, creation and diffusion of an explicit and strategic place-based vision is fundamental to success and forms the first sub-dimension of normative governance (Solvell, Lindqvist and Ketels,

2003). Bailey, Pitelis and Tomlinson (2018) argue that regional industrial strategy requires an integrative approach with appropriate policies that reflect sought-after regional competitive advantage; cluster organisations require a similar approach. The Global Cluster Initiative Survey supports this, stating that cluster initiatives who had developed a clear strategy around cluster strengths were more successful in developing cluster competitiveness (Solvell, Lindqvist and Ketels, 2003).

The second sub-dimension relates to network dynamics; these are complex relationships that emerge within clusters (Smith and Brown, 2009). It is these relationships that contribute to collaboration within clusters and is therefore linked to cluster management activities (Saggese, 2016). The nature and potential of these relationships are closely associated with strategy formulation and implementation, and can contribute to effective communication within clusters.

Network linkages are the third sub-dimension of normative governance. There remains some debate as to whether clusters achieve success through a "*strong local buzz*", or whether it is derived from being part of "*global pipelines*" (Aarstad, Kvitastein and Jakobsen, 2016; Byrne, Hobbs and Doran, 2018 p. 94).

Storper and Venables (2004) were early proponents of 'local buzz'; local buzz is grounded in regular face to face contact and is argued to make a significant contribution to collaboration within co-located firms. Furthermore, it is argued that whilst co-location (geographic proximity) enables the creation of local buzz, it also enables it to be understood in a meaningful way (cognitive proximity) (Bathelt, Malmberg and Maskell, 2004).

Global pipelines refer to those relationships between firms that exist at distance, both nationally and internationally. These strategic partnerships are managed differently to relationships at a local level; local interaction tends to be less formalised, whereas relationships within global pipelines tend to be more closely monitored (Bathelt, Malmberg and Maskell, 2004).

Whilst local buzz and global pipelines are fundamentally different, it is argued they complement each other (Bathelt, Malmberg and Maskell, 2004). Having tested the effect regional (local buzz) and international (global pipelines) innovation collaboration had on product innovation within firms, Aarstad, Kvitastein and Jakobsen, (2016) argue that in SMEs, the combined effect of both can actually be detrimental to product innovation, whereas for larger firms the effect can be positive.

Dynamic relationships and collaboration are recognised as fundamental aspects of cluster policies; therefore collaboration forms the final sub-dimension of normative governance (Wise, Wilson and Smith, 2017). It is argued that collaboration contributes to innovation. 3 Norwegian clusters reported that innovation activity increased as a result of cluster policies; 55% of respondents in a survey of Danish cluster programme members had, or planned to have, developed new products, processes or services as a result of cluster activity (Wise, Wilson and Smith, 2017). It is argued that networking, as part of the collaborative approach, contributed to the survival of Finnish shipyards (Viederyte, 2013).

b) Cognitive Governance

Cognitive cluster governance has been defined as "*actions designed to alter abstract categorizations in which the boundaries of meaning systems are altered"*

(Berthinier-Poncet, 2014 p. 6). It is related to the creation and diffusion of knowledge throughout clusters. Cognitive governance focuses on changing structures and boundaries to facilitate new ways of working. The cognitive dimension is argued to develop innovation and sustainability for members through skills development, shared practices (mimicry) and access to knowledge. This contributes to the development of architectural knowledge that helps to differentiate clusters from other networks.

The first sub-dimension is termed mimicry, and involves alignment of new practices with existing processes, practices and rules to enable new ways of working the be adopted (Lawrence and Suddaby, 2006).

Creation and diffusion of knowledge is the next sub-dimension, and forms a significant part of cluster literature (De Propris and Driffield, 2006; Falck, Heblich and Kipar, 2010; van Aswegen and Retief, 2020). Knowledge creation and diffusion typically occurs through collaborative projects and knowledge spillovers (both intentional and unintentional); with clusters exploiting regional social resources.

The final sub-dimension relates to skills development, which is argued to be important to help support new ways of working. The International Labour Organisation (ILO) (Marchese and Sakamoto, 2008 p. 2) define skills in the cluster context as the "*final outcome of any learning process occurring at cluster level [and] includes not only technical skills acquired through formal education and training, but other kinds of skills and learning that the workforce and organizations (i.e. enterprises and cluster associations) acquire through formal and informal channels*".

Both the ILO and European Union (Probst et al., 2019) cite clusters as catalysts for skills development in three areas: the first relates identifying a regional skills gap; the second to workforce development; whilst the third is linked to cluster development.

Skills gaps are industry and region-specific; a cluster is likely to have a detailed awareness of skills gaps and future needs within its region. As a result clusters become key enablers of skills strategies to meet local needs (Probst et al., 2019; Comunian and England, 2019). Member firms benefit internally from a presence of skilled labour, and the ability to attract skilled labour into the region (Viederyte, 2013). In terms of cluster development Marchese and Sakamoto (2008) link skills to increased FDI and knowledge spillovers. Whilst FDI is beyond the scope of this study, a skilled workforce makes investment more likely, in turn contributing to workforce development. Knowledge spillovers are linked to a cluster's absorptive capacity; skilled labour is required not only to generate new knowledge, but also be capable of acquiring it from those generating it.

c) Political Governance

The political dimension of cluster governance focuses on access to resources and the operating framework around which a cluster is based (Berthinier-Poncet, 2014).

Branding forms the first sub-dimension of political governance. A clear brand provides visibility and embodies a vision; it is an expression of social and economic relationships and provides a framework for developing those relationships; it determines availability of members; and implies competitive advantage (Mauroner and Zorn, 2017). This aids development of a common culture and shared language contributing to shared values and objectives.

The second sub-dimension relates to cluster membership. PWC (2011) highlight two key membership related roles that cluster managers have; the first relates to the strategic view of membership, whilst the second is linked to the facilitation of relationships. This is linked to collaboration and focuses on driving a common agenda, resolution of conflict and that value in cluster membership is realised.

A cluster organisation is responsible for the composition of membership and entry criteria; approaches include geographic location but can also extend to vetting applicants to ensure strategic fit.

The provision of support is a key part of cluster activity and forms the next sub-dimension; Wise, Wilson and Smith (2016) cite this as an essential part of a 'perfect' cluster. Internal support relates to developing and maintaining networks within clusters which leads to knowledge spillovers, but also extends to identification of skills gaps, and provision of training to overcome those gaps.

Amongst cluster organisations in Croatia, Anić et al., (2019) found that member firms saw a key role of cluster management to lobby for inward support. These activities include lobbying for subsidies, improving regulatory policy and improving incentives for FDI. This role of clusters in providing access to such external support is supported across the cluster literature generally (Parto, 2008; Lindqvist, Ketels and Sölvell, 2013; Skålholt and Thune, 2014; Wise, Wilson and Smith, 2017; Speldekamp, Saka-Helmhout and Knoben, 2020) and across maritime-specific literature (Hassink and Shin, 2005; Holte and Moen, 2010; Viederyte, 2013; Hammervoll, Halse and Engelseth, 2014; Stavroulakis et al., 2019).

These three dimensions and associated sub-dimensions are summarised as Table 3.6

Dimension of Cluster Governance	Sub-Dimension
Normative	Identity
	Strategy
	Network dynamics
	Network linkages
	Collaboration
Cognitive	Network dynamics (mimicry)
	Knowledge management
	Skills focus
Political	Membership
	Support
	Network dynamics (conflict resolution)
	Branding

Table 3.6 Dimensions and Sub-Dimensions of Cluster Governance
Source: Author

Whilst each of the dimensions discussed in this section is distinct, and contributes to separate aspects of cluster governance, they must be present for good governance to exist; namely co-ordinating (normative), controlling (political) and managing knowledge (cognitive).

Normative practices contribute to the development of a shared vision and strategy, leading to growth in trust amongst cluster firms, which in turn enables sharing of knowledge required for collaborative projects through shared meanings and understandings (cognitive), whilst political practices enable resource acquisition and provide legitimacy to the network.

3.2.4.4. Good Governance

Having considered structures and dimensions of governance, this section considers what might constitute ‘good’ governance within clusters. It is possible

to assess governance in structural terms. Heterarchical governance structures are characterised by factors such collaboration, trust, support, and shared vision (Tomlinson and Branston, 2018). These factors are linked to increased levels of innovation, regional competitive advantage, and firm growth. Hierarchical forms of governance, typically found in hub-and-spoke and state anchored structures, place greater emphasis on anchor entity and emphasise their more controlling nature.

However, rather than viewing governance in structural terms, cluster governance should be viewed in terms of effectiveness; this study draws on the definition of network effectiveness provided by Provan and Kenis (2008 p. 230) as "*attainment of positive network-level outcomes that could not normally be achieved by individual organisational participants acting independently."* Outcomes typically relate to specific network objectives, but can relate to firm-level objectives, resulting in perceived benefits and perceptions of governance as being of at least equal importance to more objective data (Kaufmann, Kraay and Zoido-lobatón, 1999; Abbey, Tomlinson and Branston, 2016). The governance of industrial districts and clusters can change over time as they mature and evolve, and it is adaptability of firms that will ultimately determine competitive advantage; this will also influence perceptions of governance (Arikan and Schilling, 2011).

Visser and De Langen (2006) discuss issues of poor-quality cluster governance; for example, ineffective co-ordination, leading to little collaboration or investment in collective sources of competitive advantage. This is reinforced by Sacchetti and Tomlinson (2009) who highlight negative consequences of ineffective co-ordination. Overall, this can have significant consequences for achievement of

strategic goals, including innovation, internationalisation, and infrastructure development, and can lead to decline of the cluster itself (Scott, 1992).

'Good' governance can therefore be characterised in terms of the three dimensions of governance, i.e., normative, political, and cognitive, and their various sub-dimensions. Good governance is manifested through effective and inclusive cluster co-ordination, development of communities of shared interest, knowledge management, clarity of strategic goals and access to support and skills development (PWC, 2011).

Whilst this section has focused on what constitutes good governance, Ford and Ihrke (2019) highlight challenges faced by researchers in terms of measuring what good governance actually is. They argue that the drive for methodological rigour can lead to perceptions of governance being ignored. The perception of governance, and whether it is 'good' or 'bad' irrespective of what may actually be happening, can have significant consequences for the performance of governing bodies. As a result it is argued that perceptions of governance are generally accepted as being proxies for governance itself (Abbey, Tomlinson and Branston, 2016; Ford and Ihrke, 2019).

3.2.5. Cluster Summary and Conceptualisation of Cluster Governance

Clusters have become a significant policy approach of regional economy policymakers. It is argued that clusters provide a business ecosystem that fosters innovation and entrepreneurship through the development of relationships, shared knowledge and regional industry identity. Cluster effectiveness can be influenced by perceived benefits of agglomeration, nature of internal competition and collaboration, barriers to entry and extent of heterogeneity of member firms.

Cluster governance provides the mechanism through which the strategic management of cluster organisations operate and is focused around three key dimensions: normative, cognitive, and political. These are conceptualised as Figure 3.3.

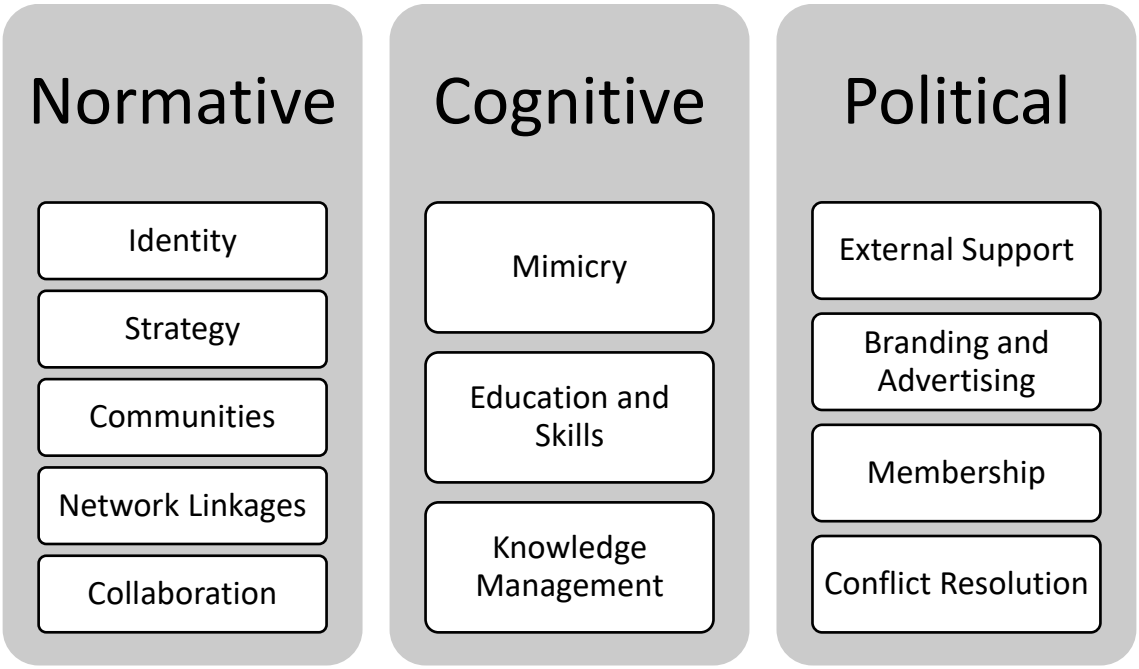

Figure 3.3 Conceptualisation of Cluster Governance
Source: Author

The conceptualisation shows the dimensions of cluster governance with their respective sub-dimensions. The normative dimension emphasises development of trust, shared identity and communities, and collective cluster goals. Cognitive governance relates to facilitation of different ways of working to enable creation and diffusion of knowledge, whilst political governance refers to the cluster's operating framework and access to external resources.

The next section explores theories of social capital and confirms key definitions used in this research.

3.3. Social Capital

There is extensive discussion of social capital spanning many disciplines. This section starts with a review of definitions, leading to the definition of social capital used in this research. The section then examines dimensions of social capital and their value within the business and clusters context. Given emphasis of place-based policies within clusters, the role of social capital in a proximity context is examined. Negative consequences are explored, before concluding with the conceptualised model of social capital.

3.3.1. Characteristics of Social Capital

Social capital is a broad concept with sociological beginnings. As a result, study of the concept is found within many different disciplines. In defining the term, there is a need for caution and care depending on the research context (Teilmann, 2012).

Social capital has been defined as '*those tangible substances that count for most in the daily lives of people: namely good will, fellowship, sympathy and social intercourse among the individuals and families who make up a social unit'* (Hanifan, 1916, cited in Kikuchi & Coleman, 2012). Greater focus on social capital as an enabler was added by Coleman (1988); importance of this point at an organisational level is reinforced by MacGillivray (2004 p. 122) who argues that social capital is the '*glue that binds together the individual skills and intelligence of the work force with the organisation's collective memory and ability to innovate.'*

Whilst these definitions start to show some key aspects of social capital, none are fully reflective of the term. Different viewpoints enable greater appreciation of

the concept, of which six are of particular relevance to this research: substance of social capital; sources; effects; interactions between actors (bonds); actors' associations with others in a collective (bridges); and both bridging and bonding in the same context (Johnson, 2010). These are examined in the rest of this section.

Social capital is one of three forms of capital, along with economic and cultural, as factors that outline an actor's place in any social setting (Siisiainen, 2000). These factors emerged from Bourdieu's theoretical views on class and social positions.

Bourdieu and Wacquant (1992 p.119) define social capital as 'the *sum of resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalised relationships of mutual acquaintance and recognition.'*

Bourdieu also promoted the 'dual-ownership' characteristic (Bowey, 2002) and although not explicitly stated, reinforced the 'capital' nature of social capital. Dual-ownership status means that it is not just individuals who can draw on and benefit from the 'fund.' Instead, others within the wider network can benefit from the development of social capital; this is discussed in section 3.3.1.6.

Social capital can be viewed through the rational action theory lens. This theory promotes the view that people will be motivated according to their preferences and under specific constraints and level of information (Coleman, 1988). The fund-like nature of social capital contributes to such factors.

Coleman (1988) argues that although social capital comprises a number of different aspects, including trust, norms, expectations and obligations, all aspects

have two common features. They are found within social structures and they enable those within such structures to achieve outcomes that would otherwise not be possible.

In considering different aspects of the definition, Coleman (1988 pp.102-104) proposes three forms of social capital; ‘obligations, expectations and trustworthiness of structures’, ‘information channels’ and ‘norms and effective sanctions.’

3.3.1.1. Obligations, Expectations and Trust

Within many social structures there is an (implicit) expectation that people will do things for one another in return for some ‘credit’, or an obligation to return the favour. This relationship is built on trust; if that credit is never repaid, trust and consequently capital, will be lost.

Coleman (1988) cites the example of rotating credit associations to support the importance of trust on social capital. Such informal associations work by people paying in to a fund. Each member can then take the whole sum once, thereby accessing more money than they would have been able to outside the scheme. This scheme would clearly fail without considerable trust being present. Whilst members of rotating credit associations are generally considered equal, there are structures where members are not considered equal, and those with more power hold an increased number of obligations.

3.3.1.2. Information

Information is important, ‘expensive’ and found in social structures (Coleman, 1988). Information is important as it provides the underpinning knowledge required to take some form of action, and also as an everyday necessity. The

exchange of information is effective in some social structures, less so in others; the strength of relationships depends on information that is both exchangeable and exchanged.

3.3.1.3. Structures of Social Capital

The role of social structures is referred to throughout these types of social capital. Whilst social capital can grow in almost any social structure, there are two forms that are most effective; the first being one that establishes closure. Closure relates to the restraint of negative or reinforcement of positive behaviours. Closure does not have to be implemented through formal systems; it is often entrenched informally through unwritten codes of conduct (Johnson, 2010).

The second structure is one that Coleman (1988) terms 'appropriable social organisation'. This refers to a structure being created for one purpose, but whose resources subsequently become important for a different purpose (Johnson, 2010). Examples can be found in many social settings, for example a resident's association was formed to deal with issues of poor construction in a housing development. Once these issues were dealt with, the association remained a source of social capital that enhanced the overall quality of life for residents by enabling access to previously inaccessible resources.

Although Putnam (1993) is often credited with popularising the term 'social capital', Bowey (2002) argues Putnam's influence extended beyond that of simple promotion. Putnam's '*Making Democracy Work'* is centred on reforms undertaken by Italy's government in the late 20th Century. Key to success of those reforms is the idea of 'civic community.' The success of reform and economic prosperity in northern Italy is attributed to the civic community; a community of so-called

'horizontal' relationships and loyalties in political, social and religious terms (Putnam, 1993). Features of this civic community also included '*collaboration, mutual assistance, civic obligation and even trust…extending beyond the limits of kinship'*; these compare to the *'imposition of hierarchy and order'* present in the less prosperous south (Putnam, 1993 p. 130). Social capital, in its various guises, i.e. trust, social norms and obligations, and social networks of activity – are *'moral resources of community;'* (Siisiainen, 2000).

Numerous authors have developed ideas proposed by Bourdieu, Coleman and Putnam. Social structures are a '*recurrent and patterned interaction between agents…maintained through sanctions'* (Swedberg, 1994 p. 255) and consist of four parts:

- A set of social units that have a number of valuable resources
- Units are hierarchically related relative to authority
- Units share rules and procedures
- Units are entrusted to occupants who act on rules and procedures (Lin, 2001 p. 33)

As a result network resources are different from those held by individuals within that network.

Homogeneity is an oft-cited assumption in the development of social capital (Arregle et al., 2007), with factors such as religion being quoted (Putnam, 1993). Business networks are unlikely to align with this assumption; heterogeneity is much more likely, especially across wider networks. This is likely to impact the development of social capital (Arregle et al., 2007).

Dale (2005) acknowledges that although displayed in a simplistic form, creation of social capital follows the process shown in Figure 3.4. This is important in the cluster context, and for cluster organisations, where development of social capital

amongst a heterogeneous set of firms forms a key part of cluster development (Chuluunbaatar et al., 2014).

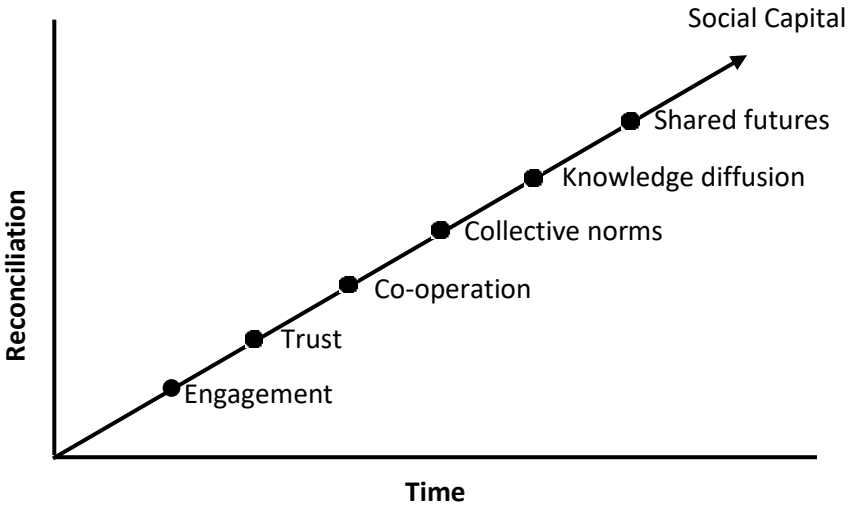

Figure 3.4 Building Social Capital
Source: Dale (2005)

Whilst shown as a simplistic, linear process, the development of social capital within clusters begins with the engagement of members in order to start building trust, both in the cluster organisation and amongst members. With key cluster goals typically including co-operation and collaboration between members, development of shared norms and collective vision are important success factors. This suggests that developing social capital in clusters is a more circular process, with different stages indicated in Figure 3.4 acting to reinforce others.

3.3.1.4. Benefits of Social Capital

Social capital "*makes citizens happier and healthier, reduces crime, makes government more responsive and honest, and improves economic productivity"* (Sander and Putnam, 2010 p. 9). Evidence suggests that social capital plays an important role in reconciling economic, environmental and social obligations

(Dale, 2005). As a result of lowering transaction costs, social capital can enable human capital to be accessed (Elkington, 1997; Bjørnskov, 2006). Svendsen and Svendsen (2004) add that groups with higher social capital will normally achieve greater economic growth.

Social capital increases benefits of being associated with a particular course of action, whilst simultaneously increasing costs of not being involved (Rydin and Holman, 2004).

There are five areas within organisational studies where social capital is an important influence,

- Influencing career success
- Providing employment opportunities
- Innovation and exchange of resources
- Reduction in labour turnover
- Improved relationships within supply chains
  (Adler and Kwon, 2002, p. 17)

Although the importance of social capital is evident in the literature, it is only one part of the wider requirements to develop benefits in communities. Although the Alutiiq hunters in Alaska hold a wealth of bonding social capital, they lack the financial or human capital to achieve successes enjoyed by the migrant population (Light and Dana, 2013).

3.3.1.5. Bridging, Bonding and Bracing

Numerous authors highlight ‘bridging’ and ‘bonding’ social capital (Adler and Kwon, 2002; Eklinder-Frick, Eriksson and Hallén, 2011; McShane et al., 2016; Wang et al., 2017; Andini and Andini, 2019). The theory of social capital in its bridging form is defined by Putnam (2000) as spreading linkages with ‘non-similar’ groups, ‘external assets’ and ‘information diffusion’, with Adler & Kwon

(2002) providing a more straightforward view that it refers to a network's external links. These definitions trace their origins back to Granovetter's (1973) pivotal work exploring the strength of ties between different groups. Groups with lower status can acquire social capital by 'bridging' into a more powerful group (Light and Dana, 2013), often resulting in higher levels of shared development (McShane et al., 2016).

Whereas bridging social capital brings together disparate groups, bonding social capital develops amongst those that share similar attributes, be that class, background or ethnic grouping (Putnam, 2000). It strengthens group characteristics and cohesion (Kusakabe, 2012) and is argued to be a key part of social capital relevant to regional development issues (McShane et al., 2016).

3.3.1.6. Fund-like status

Adler and Kwon (2002) suggest that social capital is an asset into which resources are invested with anticipated future returns, it is appropriable (Coleman, 1988) and convertible (Bourdieu 1985, cited in Adler and Kwon 2002), and that it can be complementary to other forms of capital. This last point is supported by the example of social capital improving the efficiency of transactions between actors that in turn reduces economic costs.

With social capital being a source of credit to be drawn upon, the implication is that it also provides a return on investment. This return on investment supports capital status afforded to it. Social capital enables goals to be achieved that otherwise would not be possible (Coleman, 1990). Without use and maintenance, social capital will not be developed (Adler and Kwon, 2002).

For the purposes of this research, the definition proposed by Bourdieu and Wacquant (1992) will be used; social capital is "the *sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalised relationships of mutual acquaintance and recognition*."

3.3.2. Dimensions of Social Capital

Networks and communities are fundamental aspects of social capital development, with numerous authors identifying connections and patterns of exchange between actors, influencing the dynamics of inter-firm competition and co-operation (Hunter, 2013). In the cluster context, social capital contributes to improved economic performance (Casson and Della Giusta, 2007). Two key aspects underpin this position; firstly, the social aspect highlights the social nature of networks and is linked to the frequency of gatherings; the capital part is linked to the value of future improvements. This latter point is fundamental in the cluster context given aims of enhancing competitiveness of regions (Porter, 2001).

Whilst cognisant of the many approaches to social capital scholars have adopted, Nahapiet & Ghoshal's (1998) integrated classification of social capital is particularly important in this context. Their structure placed social capital in the context of strategic management, with particular emphasis on competitive advantage. This classification is based on three inter-related aspects: structural, relational, and cognitive (Hunter, 2013). This integrated approach draws on many aspects explored by others, namely resources that are available, relationships, and potential outcomes. Although the three dimensions are discussed as separate sections, they are interdependent (García-Villaverde, Parra-Requena and Molina-Morales, 2017).

3.3.2.1. Structural Social Capital

Structural social capital refers to the factors that affect the ability of participating actors to access networks and exchange knowledge (Nahapiet and Ghoshal, 1998). It refers to density and hierarchy of linkages and ties across networks as a whole (Wasserman and Faust, 1994). As a result, the structural dimension is a facilitator that influences both relational and cognitive dimensions; stable, dense networks within which there is significant interaction amongst network actors have greater levels of knowledge exchange and affective relationships (Nahapiet and Ghoshal, 1998).

Within the cluster context, structural social capital is manifested through relationships and linkages, both within and outside the cluster.

3.3.2.2. Relational Social Capital

Whilst the structural dimension influences accessibility of actors in a network, the relational dimension refers to personal relationships made by actors within a network. Factors described earlier of trust, norms, obligations and expectation are all located in this part.

Relational social capital emerges from relationships developed by people through developing respect and friendship. These relationships enable behaviour to be influenced by trust and trustworthiness characterised by norms (Putnam, 1993). Expectations and obligations are developed as relationships grow and strengthen, and emergence of network identification occurs (Granovetter, 1985; Burt, 1992; Håkansson and Snehota, 1995). Network linkages are used as a proxy for these; without the factors discussed in this section being present it is

argued that linkages will not develop. Table 3.7 examines four constituent parts of relational social capital.

Factor	Characteristics
Trust	Within the business context, trust can be viewed as " *extent to which a person is confident in and willing to act on the basis of, words, actions, and decisions of another person*" (McAllister, 1995). Mayer, Davis and Schoorman (1995) links trust with ability, benevolence and integrity. Casson and Della Giusta (2007) define trust as an implication that an individual can rely on another to fulfil certain obligations, with trust being interpreted as "*a confident and warranted belief that the other party will honour their obligations.*" There is a link between trust and co-operation; one enables the other (Nahapiet and Ghoshal, 1998).
Norms	Norms reflect a consensus in social systems (Coleman, 1990) that enable exchange processes through motivation and opening up access (Nahapiet and Ghoshal, 1998), becoming expectations that bind (Kramer and Goldman, 1995). Norms can contribute to negative social capital, whereby more rigid structures do not allow for deviant behaviour (de Vaan, Frenken and Boschma, 2019).
Obligations and Expectations	These represent commitment to behave in a particular way, or undertake a particular task (Nahapiet and Ghoshal, 1998). These reflect a *quid pro quo* situation between network actors.
Identification	Identification relates to development of shared identity between individuals, and can result in shared values, and enhance perceived and real opportunities for collaboration (Nahapiet and Ghoshal, 1998). A lack of shared identity can lead to barriers that restrict knowledge creation and exchange.

Table 3.7 Constituent Parts of Relational Social Capital
Source: Author, based on Nahapiet and Ghoshal (1998)

3.3.2.3. Cognitive Social Capital

Cognitive social capital is linked to resources within networks that provide shared representations, interpretations, and systems of meaning among parties (Nahapiet and Ghoshal, 1998). These resources impact cognitive processes

amongst individuals as they are developed through shared language, codes and narratives. The emergence of shared narratives within communities are argued to enable creation and diffusion of knowledge. As a facilitator of information exchange, cognitive social capital is linked to the way people make sense of new information and knowledge (De Carolis and Saparito, 2006).

3.3.3. Social Capital and Proximity

Proximity has been linked to innovation, competitive advantage and economic growth of regions. Proximity takes on a number of forms beyond simple geographical agglomeration of firms, and is argued to include dimensions such as organisational, cognitive, social, and institutional effects. It is within cognitive, social, and institutional forms of proximity where social capital can make a significant contribution. Organisational proximity is excluded from discussion here as it largely relates to internal organisational structures.

Cognitive proximity relates to the ability of firms and/or individuals to share a common knowledge base, enabling them to communicate, absorb, and process new knowledge (Park and Koo, 2020). Factors of cognitive social capital such as shared language and narratives can contribute to reduced cognitive distance. Too much reduction though can undermine potential for learning and increase risks of unintentional knowledge spillovers (Boschma, 2005).

Social proximity is linked to economic relations being embedded, and being affected by relationships in a social context (Granovetter, 1985; Boschma, 2005). Social proximity is characterised by factors such as trust, friendship and shared experiences, i.e., those at the micro-level of relationships; Boschma (2005) notes that aspects of culture and values are more typically related to institutional

proximity. Firms' ability to learn and innovate is enhanced through development of long-term relationships; such relationships are influenced by all three dimensions of social capital, but particularly through structural and relational social capital. Too much social proximity can lead to deeply entrenched norms and values within a close-knit network; a reluctance to challenge these can undermine innovation (de Vaan, Frenken and Boschma, 2019).

Institutional proximity is similar to social proximity, but instead refers to macro-level aspects of relationships and communities such as high-level norms, values, rules, and cultures that control relationships, either formally or informally. Factors such as shared language and trust that lead to higher levels of social cohesion, and are typical of relational and cognitive social capital, can form an effective basis for innovation within a network (Boschma, 2005). In a manner similar to the negative aspects of social proximity, high institutional proximity can lead to demands for conformity and lack of opportunity awareness.

Whilst social capital can contribute to greater levels of proximity, social capital that generates too much proximity becomes a negative influence on learning, collaboration and innovation (Park and Koo, 2020). This links to the next section that discusses negative aspects of social capital.

3.3.4. Negative Consequences of Social Capital

Social capital has been presented so far as being a positive force, influencing group behaviour, contributing to innovation and development of knowledge, and as a mediator in the achievement of network benefits. However, there are potential negative consequences, including: preventing success of business initiatives, excessive demands of conformity, prevention of external firms' access

to the network, and group solidarity preventing members from accessing 'outsider' firms (Portes, 1998)

Bonding social capital, whilst having a number of important benefits, also has potential to undermine wider community benefits through an inability of groups to develop the bridging social capital required to form external relationships (Adler and Kwon, 2002). This can lead to conformity bias which acts as a barrier to deviant or radical innovation, and the creation of new industries (de Vaan, Frenken and Boschma, 2019). Whilst trust is a key initiator of growth and innovation, high levels of relational social capital can prevent engagement with bridging forms of social capital (McShane et al., 2016). Eventually benefits of high social capital are overshadowed by costs; Wang et al., (2017 p. 654) states that "*positive features of social capital increase at a decreasing rate while negative features intensify with accumulation*."

3.3.5. Social Capital Summary and Conceptualisation

Two characteristics are common across the range of definitions of social capital: firstly they are rooted in social structures; whilst secondly they influence individuals' behaviour within those structures (Coleman, 1988). Whilst having a fund-like status, social capital is entrenched in social ties which are jointly owned, resulting in benefits being impossible to trade (Hunter, 2013). The value of social capital lies within the ability of networks exhibiting stronger social capital to achieve more than their constituent parts alone, resulting in the achievement of objectives and goals otherwise impossible or unaffordable (Nahapiet and Ghoshal, 1998).

Whilst social capital can be beneficial, studies have identified diminishing returns; beyond a certain point, social capital fails to be an effective indicator of growth and innovative activity (Echebarria and Barrutia, 2013; de Vaan, Frenken and Boschma, 2019).

Social capital can contribute to achieving sustainable development policies and goals (Kusakabe, 2012). The development of social capital is not, in itself the solution (Rydin and Holman, 2004; Light and Dana, 2013); the root cause of a particular issue may be more severe than social capital alone can address, and as already established, social capital forms one part of more general socio-economic conditions; moreover high levels of social capital can prevent entry of firms and kinds of deviant entrepreneurial behaviour required.

As a result of the discussion in this chapter, the dimensions of social capital are conceptualised as Figure 3.5.

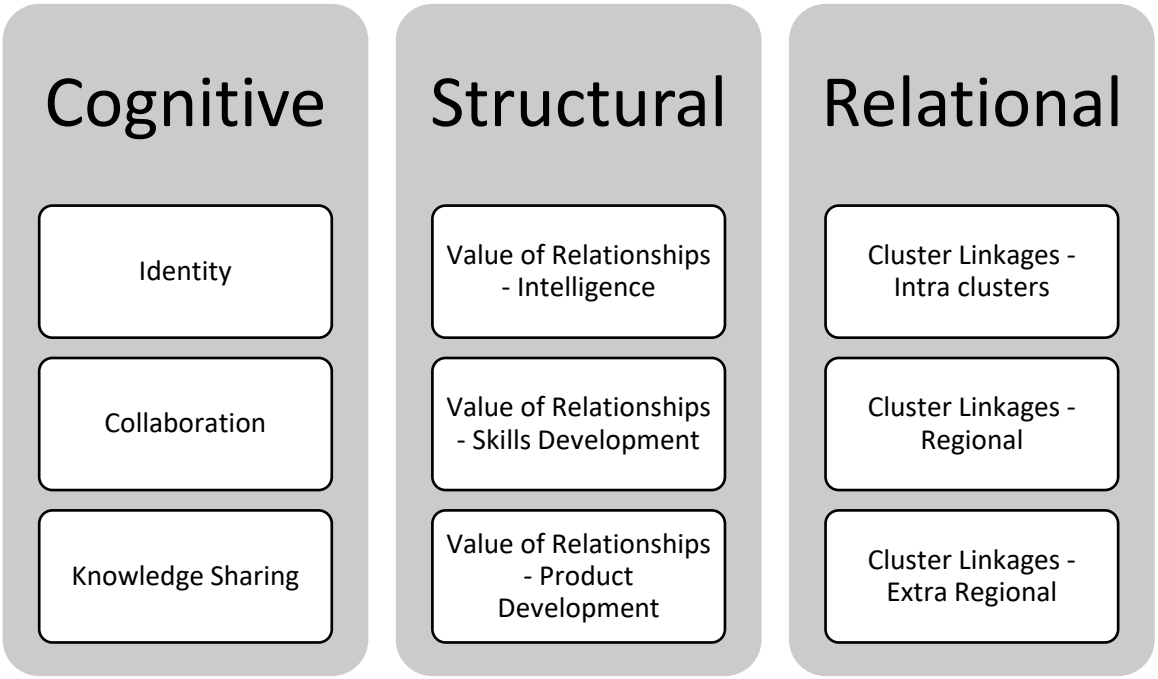

Figure 3.5 Conceptualisation of Social Capital
Source: Author

The conceptualisation shows three dimensions of social capital with their respective sub-dimensions. Cognitive social capital emphasises aspects of shared meanings that enable collaboration, and knowledge creation and diffusion. Structural social capital refers to factors that affect abilities of participating actors to access networks, conceptualised here as the perceived value of relationships. The final dimension, relational, focuses on network linkages as a proxy for relationships. Without factors such as trust being present, it is argued that network linkages will not develop.

The next section explores sustainable development as the third construct in this research and confirms key definitions and theories.

3.4. Sustainable Development

3.4.1. Defining Sustainable Development

Sustainable development was born out of a recognised need to address environmental and social concerns on a global scale: a so-called '*global agenda for change'*. The 'Brundtland Report' viewed sustainable development as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*" (World Commission on Environment and Development, 1987 p. ix).

Although the 1987 Brundtland Report is viewed as a seminal piece in the sustainable development movement (Hansmann, Mieg and Frischknecht, 2012), Morris (2012) argues that a precise start of the sustainable development concept is not possible, instead summarising a number of defining events dating back to at least 1822. Ise (1920) cites an earlier example of protection of natural

resources; a 1691 charter granted to Massachusetts Bay prohibited felling of trees more than two feet in diameter without a licence. This was due to concern regarding the supply of timber to build naval ships. An earlier ordinance passed by Plymouth Colony in 1626 highlighted '*inconveniences that are likely to arise in any community from a lack of timber'* (Ise 1920, p. 20).

Concern was also shared by a number of individuals, including Michaux (1819 p. 4) *'In America, neither the Federal Government nor several states have reserved forests….the effect is already very sensibly felt in large cities, where complaint is every year becoming more serious, not only of excessive dearness of fuel, but of scarcity of timber.'* (Ise 1920 p. 31) reports that in 1866, the Commissioner of the Land Office declared that *'supply of timber in the Lake states was so diminishing as to be a matter of serious concern.'* There are echoes of these views within the definition of sustainable development provided by WCED.

Sustainable development covers a broad range of subjects, meaning different things to different parties (Bell and Morse, 2008; Wallis, Kelly and Graymore, 2010). As a result a number of different definitions exist, although all draw on similar principles; that of links between environmental issues, socio-economic problems and concerns about ensuring a strong future for people and planet (Hopwood, Mellor and O'Brien, 2005). Sustainable development is "*also a dynamic process and an end goal"* (Raissa et al., 2014 p. 171). Sustainable development is therefore both an evolving process that underpins everyday activities but is also a target in its own right.

Rather than attempting a definitive definition of sustainable development, Parris & Kates (2003) adopted the taxonomy developed by the National Research

Council in order to reduce impacts of ambiguities associated with defining sustainable development. Table 3.8 shows this taxonomy of sustainable development goals.

What is to be sustained		**What is to be developed**	
Nature	Earth Biodiversity Ecosystems	**People**	Child survival Life expectancy Education Equity Equal opportunity
Life support	Ecosystem services Resources Environment	**Economy**	Wealth Productive sectors Consumption
Community	Cultures Groups Places	**Society**	Institutions Social capital States Regions

Table 3.8 Taxonomy of Sustainable Development Goals
Source: National Research Council (1999)

This taxonomy is similar to that developed by other researchers e.g. Raissa, Setiawan and Rahmawati (2014) and focuses on sustainable development being made up of two parts; namely things to be sustained, and things to be developed.

Whilst historically there has been an argument that business solely exists to make profit, indeed Friedman (1970 p. 1) argued that "*social responsibility of business is to increase its profits*", this view has been largely discredited in recent years with "e*ven those concerned about only business and not the fate of the planet recognize that the viability of business itself depends on the resources of healthy ecosystems – fresh water, clean air, robust biodiversity, productive land – and on stability of just societies*" (Chouinard, Ellison and Ridgeway, 2011 p. 52).

For the purposes of this research, the definition of sustainable development stated in the 'Brundtland Report' as "*development that meets the needs of the present without compromising the ability of future generations to meet their own*

needs" (World Commission on Environment and Development, 1987 p. ix) has been adopted.

3.4.2. Triple Bottom Line

Significant parts of the literature relate to sustainable development in economic terms, with Redclift (1987) stating that the development perspective of sustainable development is normally expressed in economic terms. However, as many others, including Elkington (1997); Schoolman et al. (2012) and Mawhinney (2002) assert, sustainable development not only includes economic aspects, but also addresses social and environmental concerns. The roots of the problem are "*political and social issues that exceed the mandate and capabilities of any organisation* (Hart, 1997 p. 67)*.'*

Whilst Luchs and Miller (2011) define these areas (economic, environmental and social) as the outcome dimension of sustainable development, they are more commonly referred to as the *Triple Bottom Line* (TBL), a term brought to prominence by Elkington (1997). Increasingly being viewed as the three pillars of sustainable development (Hansmann, Mieg and Frischknecht, 2012), they are interconnected resulting in the relationship between them being fundamental to sustainable development (Schoolman et al. 2012).

Underpinning the concept of the TBL is that the success of a company lies not only with the demonstration of economic strength, but also within their social/ethical and environmental behaviour (Norman and Macdonald, 2004). The TBL performs two functions - a set of tools to improve functions and decision-making processes of an organisation, together with being a reporting mechanism (Wiedmann and Lenzen, 2006). Jorgenson (2000, cited in Norman and

Macdonald, 2004 p. 245) adopted a pragmatic tone; it is "*an early warning tool that allows you to react faster to changes in stakeholder's behaviour"* and that by reacting faster, organisations can mitigate effects of those changes "*before they hit the bottom line."*

It is argued that "*development goals are always social, there are environmental conditions which need to be respected, and in order to be able to do anything, proposed solutions must be economically feasible"* (Sachs, 2008, p. 210, cited in Wojewódzka-Wiewiórska, Kłoczko-Gajewska and Sulewski, 2019).

The following sections consider the three parts of the TBL.

3.4.2.1. Economic

In its simplest form, economic sustainability refers to the "*business of staying in business"* (Doane and MacGillivray, 2001 p. 1), with authors arguing that economic sustainability is desirable to prevent "*corporate premature death*". Moreover it is generally accepted that economic prosperity is a fundamental part of sustainable development (Holthus, 2017).

In acknowledging that no single definition of economic sustainability exists, Doane and MacGillivray (2001) highlight a number of key points: maintenance of stable economic growth; increasing number of customers; innovation; economic systems that support social and environmental issues; contribution to society; community development; sourcing strategies; and resource use.

The definition of economic sustainability used in this research is the 'optimal management of tangible and intangible resources to achieve stable growth.' This means that in managing economic sustainability organisations must consider a

number of factors, including financial performance; strategic planning and management of resources and processes; and innovative performance.

3.4.2.2. Environmental

Environmental sustainability can, in simple terms, be defined as “maintenance of natural capital” (Goodland, 1995 p. 10). Natural capital has two forms: “*critical natural capital, and renewable, replaceable or substitutable*” (Elkington 1997, p. 79). These link to more general views of sustainable development being separated by factors which need to be sustained, and those which need to be developed.

A more recent definition of environmental sustainability expands on the notion of maintaining natural capital to include resilience, regenerative capacity, maintenance of diversity and societal needs. Environmental sustainability is defined “*as meeting resource and services needs of current and future generations without compromising the health of the ecosystems that provide them, and more specifically, as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate services necessary to meet those needs nor by our actions diminishing biological diversity*” (Morelli, 2011 p. 6).

In order to meet these needs, organisations need to consider a number of factors: use of environmental knowledge to inform decision making; seeking to use resources efficiently to minimise waste; to derive value from waste; and to manage their operations within an environmental management system.

3.4.2.3. Social

Social sustainability is a broad concept that incorporates aspects such as social capital, cohesion, social inclusion and exclusion. However there is little consensus on how goals of social sustainability should be defined (Dempsey et al., 2011). In recognising multiple facets a range of aspects must be covered (McKenzie, 2004). Building on this he proposes a definition of social sustainability as "*a positive condition within communities, and a process within communities that can achieve the condition"* (McKenzie, 2004 p. 23). Within this definition a range of indicators are provided, including equity of access to key services, equity between generations, sense of community ownership and responsibility and widespread political participation of citizens.

This means that in the social sustainability context, organisations must consider a number of factors including: skills development; stakeholder engagement and influence; and local community participation. Accreditation of management systems can also form part of this process.

3.4.3. Sustainable Business Models

A business model expresses ways in which interrelated functions and external relationships of a firm are undertaken in delivery of value to customers (Teece, 2010; Evans et al., 2017; Prendeville and Bocken, 2017). As a minimum, generic business models combine value proposition; supply chain; customer interface; and financial models (Boons and Lüdeke-Freund, 2013; Boons et al., 2013; Prendeville and Bocken, 2017). Business models emerged as a distinct concept in business and management literature towards the end of 20th Century. This reflected the changing nature of business and emergence of new types of organisations, such as online businesses, and provides the basis by which

approaches to management techniques are analysed. Furthermore, business models provide a means to stimulate and revitalise old and new business philosophies (Schaltegger, Hansen and Lüdeke-Freund, 2016).

Growing interest in the link between business models and corporate sustainability has followed recognition of corporate sustainability as a strategic goal (Baumgartner and Rauter, 2017); requiring a long-term approach (Lüdeke-Freund, 2009); linking structural and cultural aspects of organisations with desired outcomes (Stubbs and Cocklin, 2008); and the need to implement new policies and procedures to deliver sustainability-related outcomes (Schaltegger, Hansen and Lüdeke-Freund, 2016).

Having recognised the need to establish corporate sustainability into strategic orientations of organisations, and sustainable business models acting as mechanisms for change within organisations, the section now examines drivers of this need. There is a debate in the literature as to what drives pursuit of such goals. Studies from firms such as EY and Grant Thornton suggest that external drivers, i.e., changes in law, together with pressure exerted by customers and supply chains, are fundamental to the process. Whilst acknowledging that external drivers are of importance, Rauter, Jonker and Baumgartner (2017) argue that internal drivers can be more persuasive. These drivers include personal beliefs and attitudes, together with the need for more efficient and cost-effective business practices.

Starting with the seminal work of Stubbs and Cocklin (2008) that focused on structural and cultural traits of models required for advancing sustainable development, Schaltegger, Hansen and Lüdeke-Freund (2016) identify

sustainable the business model literature as evolving into approaches emphasising new ways of working, with Hansen, Grosse-Dunker and Reichwald (2009) developing industrial infrastructures (Wells and Nieuwenhuis, 2004); highlighting relationships with business cases; (Schaltegger, Lüdeke-Freund and Hansen, 2012); and growth across environmental and social aspects.

These evolutionary aspects have contributed to reinforcing the sustainable business model being distinct from more traditional business models. Whereas the definition of business models at the start of this section focused on value creation, adding in aspects of transformational business processes, revised infrastructures, and social and environmental attributes, the sustainable business model becomes multi-faceted. Figure 3.6 shows the conceptualised sustainable business model.

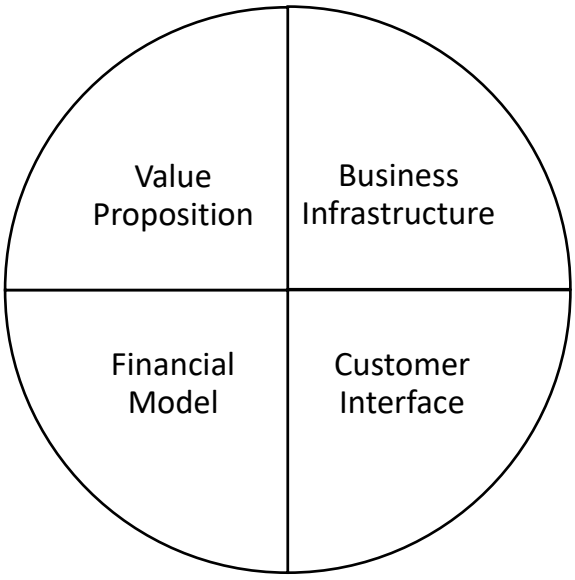

Figure 3.6 Multiple Facets of Sustainable Business Models
Source: Author, based on Schaltegger, Hansen and Lüdeke-Freund (2016)

Having identified the fundamental structure of sustainable business models, Table 3.9 expands the core points by establishing definitions and key attributes of concepts.

Aspect of Sustainable Business Model	Definition	Attributes
Value Proposition	Provision of value through products and services with respect to people, planet and profit factors	• Medium to long-term focus • Demand-driven model • Sharing of resources among stakeholders to achieve sustainable outcomes • Institutionalise sustainability in business • Stakeholder engagement
Financial Model • **Revenue model** • **Cost structure**	Financially sustainable business that distributes wealth equitably	• Shareholders invest for social & environmental impact reasons • Business makes a profit to do something more • Keep capital local
Customer Interface • **Target customer** • **Distribution channel relationship**	Close relationships with all stakeholders with responsibility for production and consumption systems	• Co-operative business strategy and planning • Collaborative model including supply chain, competitors, government agencies, communities • Demand-driven model • Stakeholder approach, including sharing of resources achieve sustainable outcomes • Implement stakeholder consultation program
Business Infrastructure • **Value configuration** • **Core competency partner network**	Principles of sustainable supply chain management embedded in business operations	• Collaborative model including supply chain • Sharing of resources among stakeholders to achieve sustainable outcomes

Table 3.9 Attributes of Sustainable Business Models
Source: Author, based on Osterwalder, Pigneur and Tucci (2005); Stubbs and Cocklin (2008) Schaltegger, Hansen and Lüdeke-Freund (2016) and Rauter, Jonker and Baumgartner (2017)

3.4.3.1. Sustainable Maritime Business Models

Having established the purpose and growth of sustainable business models, this section focuses on the relationship with the maritime industry.

With the notable exception of ports, the literature focusing on sustainable business models across the maritime industry is scarce. Where sustainability is examined, focus typically appears to be on specific outcomes and/or goals.

A number of authors examine issues of port sustainability that are linked to the development of sustainable business models: Dinwoodie et al., (2012) developed a framework to manage environmental impacts of maritime operations in ports; Kuznetsov et al., (2017) introduced a taxonomy of maritime operations within ports to guide development of port sustainability models; Jugović, Kovačić and Hadžić (2011) proposed a model of sustainable development for tourism-related ports; Lu, Shang and Lin (2016) highlighted the need for sustainable management strategies to be developed collaboratively across the supply chain; and Christodoulou and Cullinane (2019) examined factors related to Port Energy Management Systems.

Whilst these approaches reflect attributes of sustainable business models and provide for measurement of activity, few studies present a holistic model with tangible performance measures. Kuznetsov et al., (2015) developed a Port Sustainability Management System for smaller ports; the system is shown as Figure 3.7.

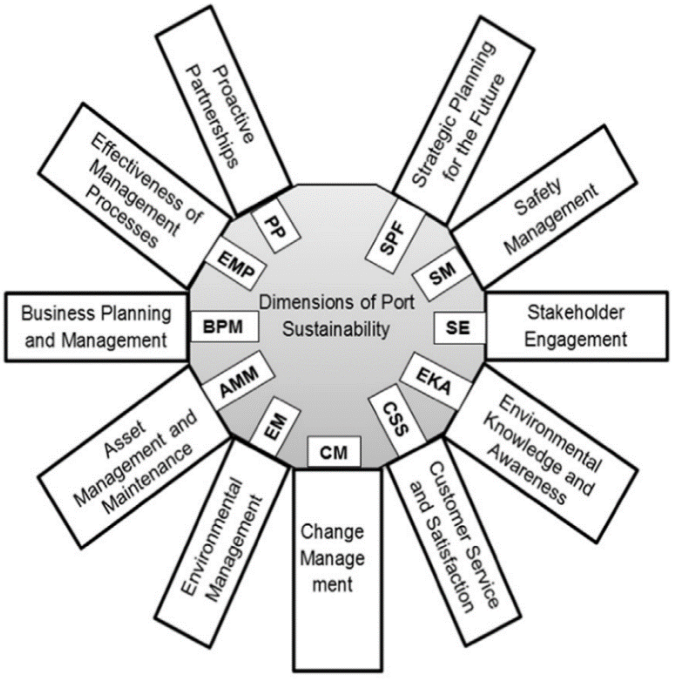

Figure 3.7 Dimensions of Port Sustainability
Source: Kuznetsov et al., (2015) p 63

These port sustainability dimensions fit generally with the value proposition, customer interface and business infrastructure aspects presented in Figure 3.6. The financial model appears less clearly represented, although it could be argued that the measure "*our assets have good life expectancy and have a financed plan for repairs and maintenance*" is an aspect of financial modelling (Kuznetsov et al., 2015, p 66). This model reflects specific sustainability needs of small ports meaning that although it is not possible to adopt it in wider maritime business contexts, it does provide a base model that can be adapted.

3.4.4. Regional Sustainable Development

Regional sustainable development is included here given the conceptual link to geographic proximity and the role of maritime cluster associations as place-based policies. This section focusses specifically on relationships between clusters and sustainable development. It examines the role of clusters within industrial ecology.

Whilst Taddeo et al. (2012) support the advantages of clusters and benefits for industrial development in Italy, they argue that the cluster model is facing challenges given increasing pressure, both socially and through regulation, to become more sustainable. It is argued that by applying principles of industrial ecology and by implementing principles of eco-industrial parks, sustainable local development can prosper.

Frosch & Gallopoulos (1989) argued for industrial ecosystems as a means of achieving sustainable development goals. This is a model where energy and material consumption are improved, waste minimised and where waste products from one process become raw materials for another. This model became the basis of industrial ecology. Although as Seager & Theis (2002 p. 226) state, early definitions of industrial ecology were shrouded in considerable ambiguity; for purposes of their research, they adopted the following definition: industrial ecology is *"a field of study concerned with the inter-relationships of human industrial systems and their environment' and industrial ecosystem: 'a model of community or system of firms…based upon a natural analogue."*

The application of industrial ecology principles and development of an industrial ecosystem, termed eco-industrial park, is of particular interest within clusters.

Whilst eco-industrial parks feature heavily in the literature, Liwarska-Bizukojc et al., (2009 p. 733) argue that a physical industrial park is not the important factor; instead it is "*industrial symbiosis involving physical exchange of materials, water and energy between entities"* that is important. Chertow (2000) explains that physical exchange is often between industries that could be traditionally considered as separate, with important factors being collaboration and geographical proximity. It is this emphasis on collaboration and place-based approach that is of particular interest to Taddeo et al. (2012) and that has particular resonance within clusters.

Lombardi & Laybourn (2012) argue that industrial symbiosis is more than exchanges of waste and other by-products in a region. They also argue that there has been growing confusion with '*agglomeration economies [and] industrial clusters where geographic proximity is a necessary condition'* (Lombardi & Laybourn, 2012 p. 28). Industrial symbiosis is strongly associated with innovation activities and knowledge networks (cognitive proximity) as opposed to simple geographic proximity. Rather than being motivated by increased efficiency in resource use, as suggested by Chertow (2000) and Chertow (2008), Lombardi & Laybourn (2012) argue that increased efficiency is simply a process outcome.

Lombardi et al., (2012) suggest that early empirical work examining industrial symbiosis in Kalundborg has played an influential role in determining importance of geographical proximity. Considering the example provided by Chertow (2008) whereby a sewage works provides water to a power station for cooling purposes who in turn provide steam to an industrial user, it is difficult to envisage this process in a non-geographically proximate setting. Lombardi et al., (2012) agree that for some types of resource sharing to take place, geographical proximity is

required, especially where transport would cause deterioration of resources. However, they argue that it is the economic and regulatory framework in which transport operates that has greater impact.

In suggesting a revised definition of industrial symbiosis, Lombardi & Laybourn (2012) broaden the scope of resource exchanges to include cognitive proximity, particularly flows of knowledge, processes and practices and other drivers of innovation. The importance of this aspect is supported by Tsvetkova & Gustafsson (2012) who integration and close-knit relationships among members of systems to be of particular importance.

By considering clusters within the context of industrial ecology and industrial symbiosis, it is possible to see scope for related firms to enhance their existing collaborative activities within innovation and sustainable development dimensions.

3.4.5. Sustainable Development Summary

This section summarises the sustainable development part of this chapter and shows the conceptualisation of the construct.

It is recognised that ‘sustainable development’ has multiple meanings depending on context, but in viewing it in a business context through the lens of the Triple Bottom Line, aspects of economic, social and environmental development become clearer. For the purposes of this research these terms have been simplified to profit, people and planet to give greater emphasis to their meaning in the research context. Having established definitions of each dimension earlier in the chapter, the conceptualised sustainable development construct is shown as Figure 3.8.

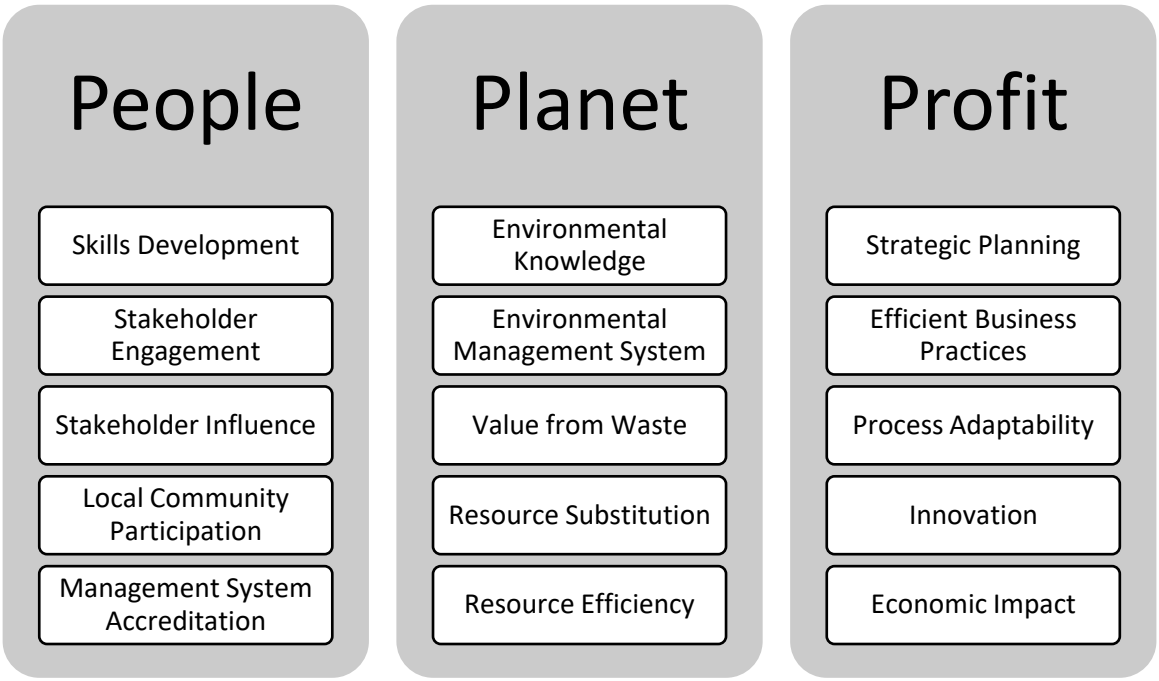

Figure 3.8 Conceptualisation of Sustainable Development
Source: Author

The conceptualisation shows three dimensions of sustainable development broken down into sub-dimensions that forms the basis of the measurement model. The people dimension emphasises stakeholder engagement, skills development and management processes. The planet dimension focuses on natural resource use and draws on concepts from the industrial symbiosis literature such as value creation. The final dimension is titled profit and integrates aspects of business process and innovation that are key to models of economic sustainability.

3.5. Conclusion

This chapter has explored the constructs of cluster governance, social capital and sustainable development used in this research.

A review of the literature has shown variations of clusters that have emerged from early Marshallian industrial districts and highlighted differing approaches to control and co-ordination. This led to discussion of cluster governance and the role of cluster organisations as a management and governance structure. Cluster governance was defined, with normative, cognitive, and political dimensions explored.

Social capital was defined based on Nahapiet and Ghoshal's (1998) framework. The concept was explored in terms of cognitive proximity and the role this plays in innovation and competitiveness. Negative issues were considered.

Finally, the chapter focused on three dimensions of sustainable development, and linked these to business models and regional issues.

Having examined the key concepts, confirmed definitions and identified indicators used in the measurement model, the thesis moves on to chapter 4, and examines theoretical and empirical linkages between constructs.

Chapter 4. Theoretical Framework and Conceptual Model

4.1. Introduction

The examination of the literature in chapters 2 and 3 established the factors central to the research aim. It showed a number of positive effects of (maritime) clusters and cluster policy; the role of social capital within clusters; and it highlighted the development of sustainable business models and the link to sustainable development. Whilst there is no one single unifying theory linking cluster governance, social capital and the sustainable development of businesses within maritime cluster associations, there are a number of theoretical models and empirically tested theories which do support the conceptual model presented as Figure 4.1.

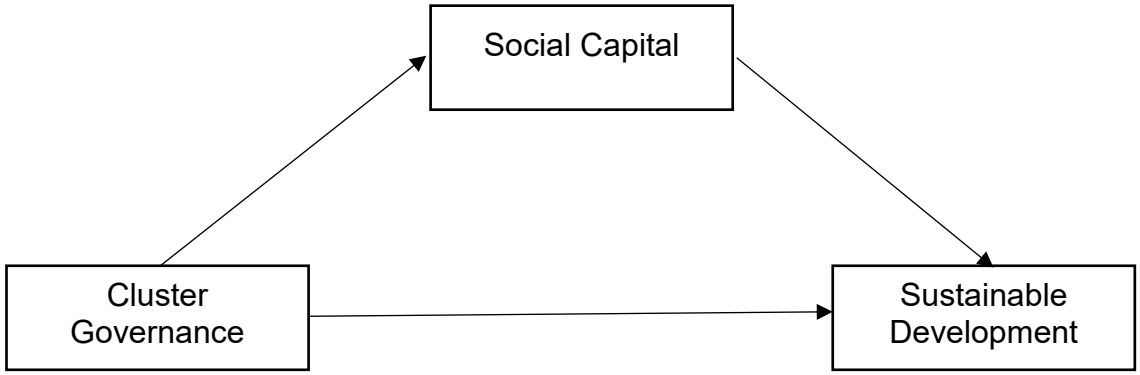

Figure 4.1 Initial Conceptual Model
Source: Author

The purpose of this chapter is to develop and justify the framework showing key theoretical relationships between cluster governance, social capital and sustainable development. It starts with discussion of the collective action within clusters, before examining the relationship between cluster governance and sustainable development. The relationship between cluster governance and social capital is then considered, finishing with the relationship between social

capital and sustainable development and the mediating role of social capital. The chapter concludes by presenting the finalised conceptual model, research questions and the hypotheses that were tested.

4.2. Cluster Organisations and the Logic of Collective Action

Membership of a cluster association is a rational choice. This choice is likely to be made on a cost/benefit basis against a series of alternatives (Bennett, 1998). With the cluster organisation representing the collective interests of member firms, demand for membership is influenced by two key factors: the 'logic of membership' and the 'logic of influence' (Olson, 1971; Bennett, 1998; Tomlinson, 2012).

The 'logic of membership' is linked to the responsiveness of cluster organisations to the demands of individual firms and the provision of business support. This can contribute to firm competitiveness and to a regional collective identity, but can undermine strategic long-term development (Tomlinson, 2012). It is further argued that too much emphasis on practices supporting the 'logic of membership' can lower the ability of the cluster organisation to offer consistency in the collective 'voice' of the cluster (Tomlinson and Branston, 2018).

The 'logic of influence' relates to the role of the cluster organisation to act as the collective voice for clustered firms. This can contribute to the development of firm competitiveness through the provision of collective services but may involve compromising shared objectives. Firms may become apathetic towards membership if their individual needs are not met. Associations based on the 'logic of influence' can suffer the free-rider problem, where non-members benefit from

the actions of others. This can reduce incentives for firms to remain members, often resulting in small memberships (Olson, 1971; Bennett, 1998).

Cluster governance, taking into account the logic of membership v logic of influence debate, contributes to the development of social capital, particularly shared understanding, vision and goals. Increased consensus and incentives to participate are likely to improve participation in cluster activities and the achievement of shared objectives. As a result, it is argued that collective action is more likely to occur (Tomlinson, 2012). A positive perception of cluster governance is therefore argued to have a positive effect on both sustainable development (section 4.3) and social capital (section 4.4). Social capital within the cluster is also likely to impact sustainable development as firms share closer relationships, collective vision and understanding (section 4.5). Finally, with cluster governance argued to enhance social capital, social capital will in turn act as a mediator between cluster governance and sustainable development (section 4.6).

The next section considers the theoretical and empirical relationships between cluster governance and sustainable development.

4.3. Cluster Governance and Sustainable Development

This section is divided into three parts; the first establishes the theoretical relationship between clusters and sustainable development, the second discusses the theoretical relationship between cluster governance and sustainable development, with the third examining the empirical relationship. It is necessary to explain the relationship between clusters and sustainable

development first as clusters are the context, with cluster governance providing the mechanism through which clusters operate.

4.3.1. Clusters and Sustainable Development: The Theoretical Rationale

It is argued that the nature of clusters means that they can enable a business ecosystem in which common sustainable development goals can be identified and worked towards. There are four key aspects of clusters that contribute to sustainable development; enhancing knowledge creation, collaboration, business growth and strengthening of regional identity (Knauseder, 2009; Glinskiy et al., 2016; Srovnalíková, Havierniková and Guščinskienė, 2018). These four aspects are examined in sections 4.3.1.1 to 4.3.1.4.

The impact of cluster governance on these aspects is introduced in section 4.3.2 along with empirical support for the relationships between each of the three dimensions of cluster governance and sustainable development.

4.3.1.1. Enhance Knowledge Creation

Within knowledge-based economies, it has long been argued that knowledge, learning and innovation are the most important aspects driving competitiveness (Knauseder, 2009), and more recently knowledge creation has been argued to be critical to sustainable development (Cash et al., 2003; Siltaoja, 2014).

A considerable part of the cluster literature acknowledges the role clusters play in the creation and diffusion of knowledge between cluster actors (Breschi and Lissoni, 2001; Bathelt, Malmberg and Maskell, 2004; Globerman, 2005; De Propris and Driffield, 2006; Falck, Heblich and Kipar, 2010; van Aswegen and Retief, 2020). Knowledge creation and diffusion typically occurs through

collaborative projects and knowledge spillovers (both intentional and unintentional); with clusters exploiting the social resources of the region. Such resources include trust, shared values and history and common cultural codes (Knauseder, 2009).

As a consequence of knowledge creation being linked to sustainable development goals, there is a clear theoretical relationship given the typical cluster focus on developing a strong business ecosystem to enhance competitiveness through innovation and knowledge creation.

4.3.1.2. Drive Business Growth

A fundamental objective of sustainable regional development is the enhancement of regional value added through the process of upgrading of local SMEs (Knauseder, 2009). From an economic perspective, upgrading is defined as "*a move to higher value activities in production, to improved technology, knowledge and skills, and to increased benefits or profits deriving from participation in global value chains*" with specific emphasis on upgrading products, processes, functions and value chains (Gereffi and Lee, 2016 p. 29). Linked to this is the concept of social upgrading, whereby workers have greater overall well-being through improved rights, entitlements and quality of their work and working conditions (Gereffi and Lee, 2016).

Srovnalíková, Havierniková and Guščinskienė (2018) examined SMEs motivations for involvement with clusters with the results indicating a link between actions required for upgrading to occur and cluster membership; key motivating reasons include: a perceived increase in the number of innovations; an increase in competitiveness; and access to information, markets, and contacts.

This lends support to the relationship between clusters and sustainable development given that clusters can drive sustainable regional development which is linked to the upgrading of business particularly for SMEs (taking in aspects of economic, social and environmental development), and upgrading being a perceived benefit of cluster membership.

4.3.1.3. Promote Collaboration

Dynamic relationships and collaboration are recognised as fundamental aspects of cluster policies (Wise, Wilson and Smith, 2017). It is these relationships which can lead to common sustainability issues being identified and collaborative projects instigated to work towards their resolution. Industrial symbiosis provides an example of collaboration to achieve sustainable development goals. Knauseder (2009) points to the leather clusters of Tamil Nadu in India as further evidence of clusters supporting sustainable development goals; by linking industry, research institutes and regional government, the leather industry was able to collaborate to reduce the environmental impact of their industry. The ports sector and their supply chains are argued to have network-like characteristics; Lu, Shang and Lin (2016) established the importance of collaboration both internally and externally to enhance sustainability performance.

4.3.1.4. Strengthen Regional Identity

"*Endogenous development is more likely to be successful when people are able to identify with the region they live and/or work in. Regional identity attaches people to places and motivates them to become involved in the region's activities. Furthermore, it contributes to creating a group identity that in turn generates a feeling of belonging and promotes communication and collaboration*" (Lardelli et al., 2016 p. 11). These points emphasise that 'endogenous potentials', or place-

based factors, are critical to effective sustainable development activity. Cluster policies are time- and place-specific which seek to identify and leverage the particular strengths, or endogenous potentials, of the region. Examples of regional identity being used to place emphasis on regional development policies are evident throughout the maritime industry; examples include Mersey Maritime, Maritime London, and Maritime Cluster Copenhagen North.

4.3.1.5. Summary

The review of theoretical links between the aims of clusters and sustainable development has highlighted a number of key aspects of cluster policy that are key to developing effective sustainability policies and processes. These aspects are summarised in Table 4.1 and linked to sustainable business models in Table 4.2.

Enhance Knowledge Creation	Drive Business Growth	Promote Collaboration	Strengthen Regional Identity
• Communities • Collaboration • Proximity • Knowledge Sharing • Skills • Strategy • Support	• Communities • Collaboration • Proximity • Knowledge Sharing • Skills • Strategy • Support	• Communities • Collaboration • Proximity • Knowledge Sharing • Skills • Strategy • Support	• Regional Identity • Communities • Proximity • Strategy

Table 4.1 Aspects of Clusters Critical to Sustainable Development
Source: Author

Aspect of the Sustainable Business Model	Definition	Attributes	Link to Cluster Policies
Value Proposition	Provision of value through products and services with respect to people, planet and profit factors	• Medium to long-term focus • Demand-driven model • Sharing of resources among stakeholders to achieve sustainable outcomes • Institutionalise sustainability in the business	• Regional identity • Skills • Knowledge sharing • Strategy
Financial Model	Financially sustainable business that distributes wealth equitably	• Shareholders invest for social & environmental impact reasons • Business makes a profit to do something more • Keep capital local	• Geographical Proximity • Collaboration • Support
Customer Interface	Close relationships with all stakeholders with responsibility for production and consumption systems	• Co-operative business strategy and planning • Collaborative model including supply chain, competitors, government agencies, communities • Demand-driven model • Stakeholder approach, including sharing of resources achieve sustainable outcomes • Implement stakeholder consultation program	• Collaboration • Knowledge sharing • Strategy • Communities • Support
Business Infrastructure	Principles of sustainable supply chain management embedded in business operations	• Collaborative model including supply chain • Sharing of resources among stakeholders to achieve sustainable outcomes	• Collaboration • Support • Communities

Table 4.2 Relationships between Sustainable Business Models and Cluster Policies
Source: Author

Effective cluster governance has been shown to have a positive impact on network-level objectives (Visser and De Langen, 2006; Sacchetti and Tomlinson, 2009); it is therefore argued that cluster governance provides the process through which factors of cluster policy shown in the centre of Figure 4.2 are strengthened, with a subsequent positive effect on sustainable development.

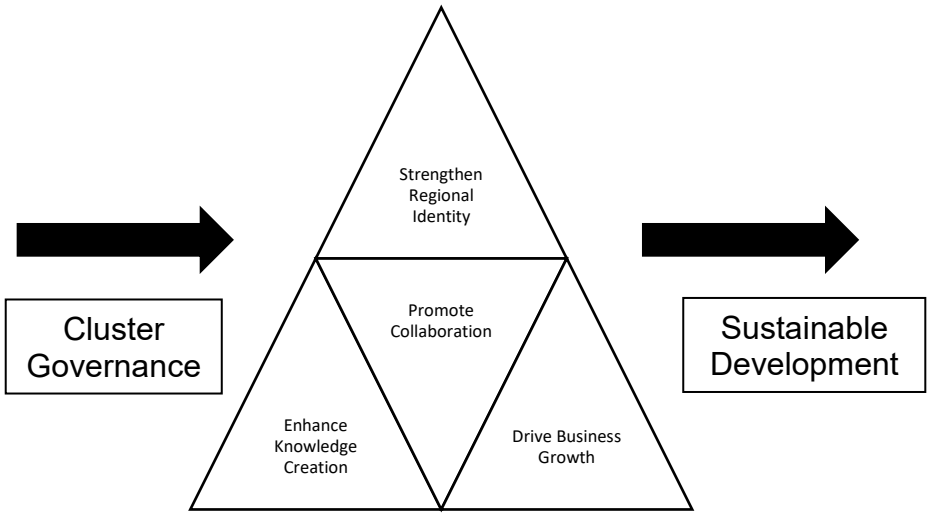

Figure 4.2 Theorised Effect of Governance on Cluster Policy and Sustainable Development
Source: Author

As a result, this is theorised as:

H1: A positive perception of cluster governance enhances sustainable development within maritime cluster associations.

4.3.2. Cluster Governance and Sustainable Development: Empirical Support

Having established theoretical links between cluster governance and sustainable development in the previous section, this section focuses on empirical support for the relationship between cluster governance and sustainable development.

4.3.2.1. Normative Governance

Normative governance refers to the approaches taken to develop stable relationships, shared identities and trust between member firms (Berthinier-Poncet, 2014). In recognising that cluster governance provides the mechanism within cluster associations to achieve such networks of collaboration and knowledge-sharing amongst member firms, the theoretical link between normative governance and sustainable development becomes apparent. In the resource conservation context Bixler et al., (2016) argue that models of governance that develop networks of collaboration offer a method that can overcome traditional environmental challenges. Additionally, different organisations within networks may work towards different goals based on individual priorities, including organisational development, social sustainability or economic sustainability (von Malmborg, 2003); effective cluster governance drives the strategic creation of communities through shared identity, trust and network linkages. Berthinier-Poncet (2014) cites the example of the regular 'Solar meetings" within the Savoie Technolac cluster as a way in which normative governance contributes to sustainable development, in this case through shared focus on renewable solar energy. This leads to sub-hypothesis H1a as follows:

H1a: A positive perception of normative governance enhances sustainable development within maritime cluster associations.

4.3.2.2. Cognitive Governance

Cognitive governance was defined earlier as the management of practices designed to enable knowledge-sharing. With cluster organisations again providing the policy driver for knowledge sharing, and the sharing of knowledge

occurring through collaborative projects and knowledge spillovers, it is the governance of the clusters that will enable policy objectives to be realised.

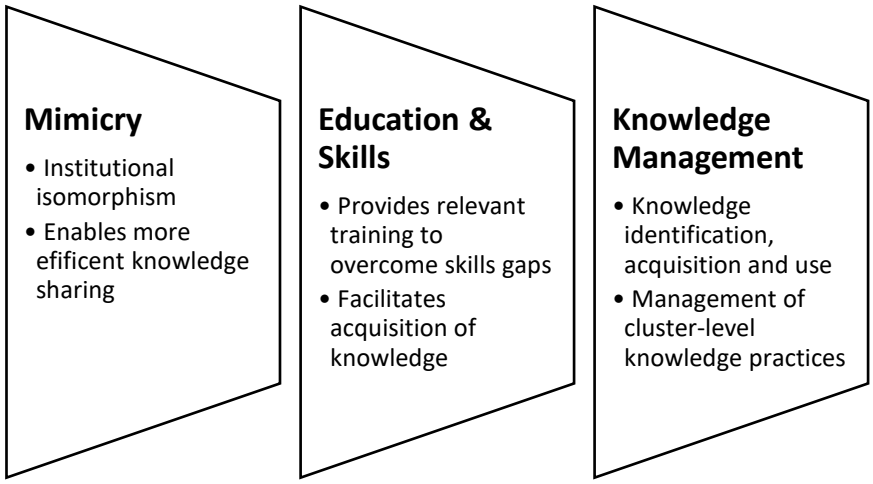

Figure 4.3 Model of Cognitive Governance
Source: Author, based on Berthinier-Poncet (2014)

Masocha and Fatoki (2018) found that the dimensions of sustainable development amongst SMEs were significantly influenced by mimicry isomorphism with specific practises being developed by imitating larger firms; this may be due to issues of uncertainty reduction (DiMaggio and Powell, 1983), legitimacy and/or potential or perceived exclusion from networks and collaborative projects. Awareness of aligned practices can enable cluster managers to develop policies that can influence strategic processes of member firms and facilitate sustainable development practises.

Supporting education & skills development supports the creation and diffusion of knowledge in two ways: firstly it provides the skills and knowledge necessary to support the institution (in this case the cluster Organisation) (Lawrence and Suddaby, 2006); and secondly to acquire knowledge (Berthinier-Poncet, 2014).

In acknowledging that cognitive forms of cluster governance provides facilitation for knowledge management processes (Figure 4.3), there is a logical extension

that there is a theoretical relationship between cluster governance and sustainable development. Prause (2014) argues that managing the intensity and quality of co-operation, linked to knowledge exchange, enhances sustainable development in logistics clusters. This results in the second sub-hypothesis:

H1b: A positive perception of cognitive governance enhances sustainable development within maritime cluster associations.

4.3.2.3. Political Governance

Political governance was defined earlier as those practices that support the identity of the cluster and the acquisition and allocation of resources through the establishment of rules.

Aspect of Political Governance	Associated Practices
External Support	Resource acquisition
Branding & Advertising	Corporate cluster communication and advertising
Membership	Rules-based membership; roles and status of members
Conflict Resolution	Formal and informal resolution practices; clear authority

Table 4.3 Political Governance Aspects
Source: Author, based on Berthinier-Poncet (2014)

Table 4.1 highlighted one of the roles of clusters as strengthening regional identity. This was further linked to sustainable development through Lardelli et al.,*'s.*, (2016) work that demonstrated regional identity as being a motivator to become involved activities within the region. Using the definition of a cluster brand as being "*the core attributes and unique value proposition of the cluster in its sum as well as the communicative relationships among the internal actors and by the interaction between internal and external actors"* (Mauroner and Zorn, 2017 p.

296) highlights the importance of a clear brand in order to achieve particular policy objectives of the cluster.

A clear brand provides visibility and embodies a vision; is an expression of social and economic relationships and provides a framework for developing those relationships; determines availability of members; and implies competitive advantage. Furthermore, the cluster manager is an important link in the branding aspect (Mauroner and Zorn, 2017). This chapter so far has highlighted the importance of such factors in the relationship between cluster organisations and sustainable development, and with cluster governance being the enabling factor, a theoretical link between cluster governance and sustainable development emerges. Zamparini and Lurati (2012 p. 506) argue that cluster identity characterises "*both the skin and the soul of cluster firms",* enabling not only a collective identity to be formed and projected, but also enhances the collective 'soul' of the cluster. Similarly, emphasis on local membership reinforces the local 'brand' and identity.

There is evidence outside the maritime cluster context to support the relationship between the branding/identity aspects of political governance and sustainable development; regional identity has been deemed important in the development of sustainable tourism projects (Sani and Mahasti, 2012); similarly place branding plays a significant role in the sustainable development of that place (Maheshwari, Vandewalle and Bamber, 2011; Boesso, D'Orazio and Torresan, 2012).

Whilst there appears to be little in the literature relating conflict resolution at firm level to sustainable development, there is a body of literature that links conflict resolution to sustainable development goals suggesting that stable and peaceful

relations can make a contribution (Miklian, Alluri and Katsos, 2019). This point has a more International Relations focus and is thus outside the scope of this research; however, conflict resolution within the cluster context could contribute to the development of rules and behaviour. The final sub-hypothesis in this part is therefore determined as:

H1c: A positive perception of political governance enhances sustainable development within maritime cluster associations.

4.3.3. Cluster Governance and Sustainable Development Summary

Section 4.2 aimed to explain the theoretical and empirical relationships between cluster governance and sustainable development. It began with a review of the relationships between cluster organisations and sustainable development as the context, before focus turned to the effects of cluster governance. This is because whilst cluster organisations provide the policy framework that can drive sustainable development practices, it is cluster governance that facilitates the policy objectives and behaviour.

Effective cluster governance contributes to sustainable development through cluster strategies emphasising related activity, improving collaborative working between firms, facilitating knowledge creation and diffusion, and providing support for innovation (Lawrence and Suddaby, 2006; Maheshwari, Vandewalle and Bamber, 2011; Berthinier-Poncet, 2014; Masocha and Fatoki, 2018; Prause, 2014).

Relationships between normative, cognitive and political aspects of cluster governance and sustainable development were established and justified in this section. In summary, normative governance provides for the development of

communities and collaborative networks that can enable the development of shared goals; cognitive governance provides for knowledge sharing, education and the development of skills; with political governance enabling regulatory mechanisms and support. The next section focuses on the relationship between cluster governance and social capital.

4.4. Cluster Governance and Social Capital

This section is divided into two parts; the first supports the theoretical relationship between cluster governance, with the second examining the empirical relationship between cluster governance and social capital.

It has been long-argued that geographic, or spatial, proximity is of significance to the knowledge-based economy (Wolfe, 2002). This is largely due to the ease in which partners can interact and easily exchange information. Spatial proximity allows for a higher frequency of communication and greater opportunities for informal and unplanned interaction. Knauseder (2009) suggests that geographic proximity also gives rise to endogenous resources that include trust, shared values and history, and common cultural codes. These social capital factors are significant in terms of cluster development and are high on the agenda of regional development policymakers.

The nature of such interaction and resources link closely to the development of social capital in networks. social capital literature has talked extensively of the role the concept can play in community development (Bridger and Luloff, 2001; Akçomak and ter Weel, 2009; Crescenzi, Gagliardi and Percoco, 2013; Cáceres-Carrasco, Santos and Guzmán, 2019), including environmental and social aspects. With clusters seeking to develop trust, social interactions and

collaboration between individuals, there is a theoretical link between clusters and cluster policies and social capital.

In acknowledging the role social capital can play in clusters, Huber (2009 p. 166) argues that social capital is dependent on a number of factors: firstly, the ability of individuals to acquire work-related knowledge from others, thus dependent on the "*number, structure and quality"* of the relationships; secondly, the enduring quality of such relationships is critical to ongoing maintenance of social capital and its associated benefits; and thirdly, the nature of the 'spatial' dimension and the ability of individuals to communicate effectively has an impact. This relationship is theorised as hypothesis H2:

H2: A positive perception of cluster governance enhances social capital within maritime cluster associations.

This remainder of this section focuses on the three aspects of cluster governance and their relationship with social capital, with each section concluding with their respective sub-hypothesis.

4.4.1. Normative Governance

Normative governance is the mechanism by which strong and stable relationships, shared identities and trust between member firms are developed. These aspects are critical to the development of social capital; Dale (2005) identifies these as steps towards the development of strong social capital. Figure 4.4 shows a simple linear model of social capital developing over time as bonding ties are strengthened through issues of normative governance seeking to develop and sustain meaningful connections, reciprocal arrangements, and effective communication in networks.

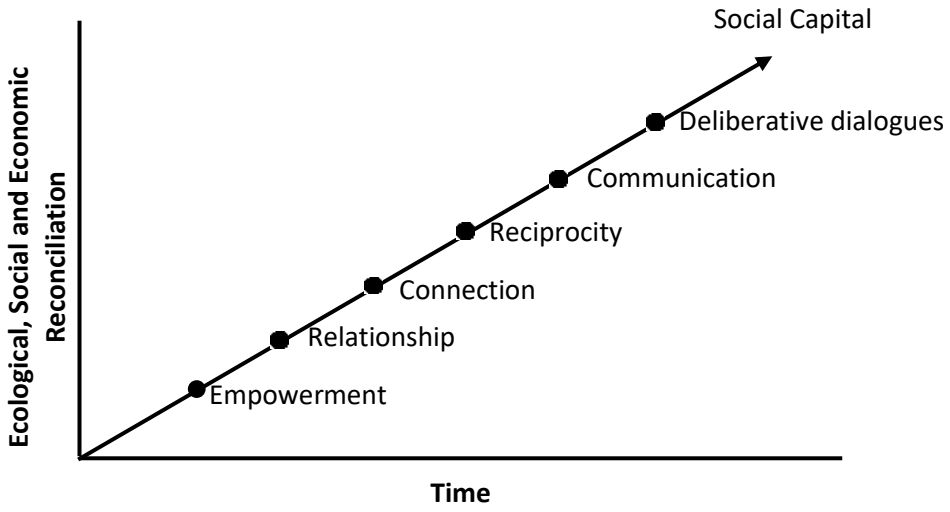

Figure 4.4 Social Capital Development
Source: Dale (2005)

From this there is a clear theoretical link between normative cluster governance and social capital. Smith and Brown (2009) found evidence amongst Scottish clusters of enhanced networks leading to greater social capital in the form of collaboration and trust. There were similar findings in a study examining the Northwest Ohio greenhouse cluster region (Reid and Smith, 2012). This leads to sub-hypothesis H2a:

H2a: A positive perception of normative governance enhances social capital within maritime cluster associations.

4.4.2. Cognitive Governance

Practices designed to enable knowledge-sharing are the basis of cognitive governance. In a way similar to the relationship between cognitive governance and sustainable development and linked to the model of cognitive governance shown in Figure 4.3, so cognitive governance has a relationship with the development of social capital. . Whilst closer cognitive proximity has been shown to facilitate sharing of knowledge, abuse of that proximity, either real or perceived,

can lead to relationships breaking down, growth of distrust amongst network members and social capital diminishing.

From a theoretical standpoint, there is a link between the management of knowledge-sharing practices and increased social capital. It is argued that inaccessible networks and a deterioration in the business ecosystem can lead to the decline of clusters, with Menzel and Fornahl (2009) highlighting the decline of once significant agglomeration economies such as textiles in Manchester and automobiles in Detroit as being in part linked to an overly rigid knowledge infrastructure. This is therefore hypothesised as:

H2b: A positive perception of cognitive governance enhances social capital within maritime cluster associations.

4.4.3. Political Governance

Political cluster governance is characterised as those practices that support the acquisition and allocation of resources through the establishment of identity and rules for the cluster; forming "*both the skin and the soul of cluster firms"* (Zamparini and Lurati, 2012 p. 506)*,* Political cluster governance enables not only a collective identity, but also a collective 'soul' to be developed. These processes reinforce the model of social capital development shown in Figure 4.4, and leads to the final sub-hypothesis of this section as:

H2c: A positive perception of political governance enhances social capital within maritime cluster associations.

4.4.4. Cluster Governance and Social Capital Summary

Section 4.2 aimed to explain the theoretical and empirical relationships between cluster governance and social capital. The section started by reviewing the relationships between clusters and social capital, before establishing and justifying the relationships between the three aspects of cluster governance and social capital. In a similar approach to the section examining the relationship between cluster governance and sustainable development, the section adopted this method because whilst cluster organisations provide the policy framework that can drive the development of social capital, it is cluster governance that facilitates the policy objectives and behaviour.

Social capital is characterised by shared norms, trust and relationships. Effective cluster governance, through the development of shared vision, cluster identity and collaborative working contributes to the development of shared norms, trust and relationships (Dale, 2005; Visser and De Langen, 2006; Smith and Brown, 2009; Wise, Wilson and Smith, 2016).

The next section focuses on the relationship between social capital and sustainable development.

4.5. Social Capital and Sustainable Development

Social capital influences various business outcomes, including innovation, profitability, and firm survival (Houghton, Smith and Hood, 2009). As trust and collective identity grows within a region, it results in collective action helping to overcome market failures and contributes to social and economic development (Maennig and Ölschläger, 2011).

Social capital is a key part of developing sustainable communities; for example Tsai (2008) found that social capital had a positive effect on recycling rates. Furthermore, in a study exploring the impact of social capital on conservation attitudes towards the Cat Tien National Park in South Vietnam, Thuy et al. (2011) found that social capital had a significant impact on the overall conservation attitudes of local people.

Given the empirical research supporting a link between social capital and sustainable development, this section seeks to examine the relationship further and situate it in the context of clusters and cluster policies.

Table 4.4 highlights barriers to the implementation of sustainable development policy and the contribution social capital can make in overcoming such barriers.

Barrier	Basis of Problem	Role of social capital	Type of social capital
Lack of participation • By communities • By other stakeholders	Collective action problem	Can incentivise participation	
Lack of will • Within political or economic organisations	Stakeholders failing to recognise the importance of sustainable development	Can facilitate links between those who can influence stakeholders	Bonding
Conflicts in defining sustainable development • Within government • Between government and economic organisations	Sustainable development defined depending on individual perspectives and objectives	Development of relationships between stakeholders to work towards a definition	Bridging, bonding or bracing
Lack of resources and capacity • Within government • Within industry	Stakeholders poorly resourced and unable to act	Development of links between stakeholders to free resources and develop capacity –	Bonding
Lack of co-operation • Between government and industry • Between civil society and industry • Between civil society, industry and government	Little incentive to co-operate	Can adapt incentive structures	Bridging, bonding or bracing

Table 4.4 Barriers to the Implementation of Sustainable development Policy
Source: Author, adapted from Rydin & Holman (2004)

In addressing the points highlighted in Table 4.4, Rydin & Holman (2004) suggest three areas where social capital impacts sustainable development. These relate to engagement and development, resource management, and through the enhancement of the policy process.

Kusakabe (2012), although acknowledging the limitations of the case study used in her research, found that social capital can contribute to attaining sustainable development goals and support regional sustainable development policies.

Whilst there appears general consensus that social capital has positive effects, Rydin & Holman (2004) suggest that how social capital is effective is not considered. In making this point, they argue that there are two approaches to be taken; the first is to consider how social capital can be utilised to overcome ‘collective action problems’ (CAP) and in the reduction of inter-actor transaction costs.

Firms must invest resources in order to achieve sustainable development goals: investing in innovation is a core aspect which results in changes to processes and technologies; firms need to invest time and effort into collaborative working (internally and externally) to achieve change; and similarly investing in regional networks contributes to the creation and diffusion of knowledge (Devine-Wright, Fleming and Chadwick, 2001). Enhanced social capital, in the form of reciprocal understanding, shared vision, and trust develops as firms invest in collaboration and networks. This reduces cognitive proximity, further reinforcing social capital and reduced transaction costs. This aligned with the business benefits of social capital discussed earlier, further contributes to sustainable development outcomes.

Engagement and co-operation were found to be key in developing sustainability practices in the supply chain (Silva and Figueiredo, 2020). These link back to the relationships between cluster governance and sustainable development, and

cluster governance and social capital examined earlier in the chapter. This relationship is theorised as:

H3: A positive perception of social capital enhances sustainable development within maritime cluster associations.

A lack of resource availability and/or capacity can cause issues for firms seeking to make changes in how resources are used, types of resource and in seeking value from waste. It is argued that social capital can ease such constraints by developing relationships with those who have the appropriate availability and/or capacity (Rydin and Holman, 2004).

Reaching consensus in sustainable development terms is difficult; within the regional context there are a number of actors who may have different objectives. In order to overcome these barriers it is argued that social capital can be employed to bridge the initial gap; strengthen relationships and develop reciprocal exchanges amongst cluster actors; and finally to maintain a set of norms and the required level of commitment (Rydin and Holman, 2004). Each of the three sub-dimensions of social capital (structural, relational, and cognitive) contribute to the creation and maintenance of such relationships, with the contribution of each sub-dimension hypothesised as:

H3a: A positive perception of structural social capital enhances sustainable development within maritime cluster associations.

H3b: A positive perception of relational social capital enhances sustainable development within maritime cluster associations.

H3c: A positive perception of cognitive social capital enhances sustainable development within maritime cluster associations.

4.5.1. Social Capital and Sustainable Development Summary

Although there is a theoretical and empirical link between social capital and sustainable development, social capital alone is not enough to sustain long-term sustainable development (Dale and Newman, 2008). Social capital must be established within a wider socio-economic policy framework.

4.6. The Mediating Role of Social Capital

The chapter has examined the theoretical and empirical relationships between cluster governance and sustainable development, cluster governance and social capital, and social capital and sustainable development.

Whilst there is an argument that social capital will have an impact on sustainable development in its own right, so there is an argument that social capital will act as a mediating variable (Harris, Wright and McMahan, 2019; Weerakoon et al., 2019).

A number of qualitative and quantitative studies are cited including Cainelli et al., (2005) who, within industrial districts identified a positive relationship between social capital and R&D. Social capital does not act within a vacuum though; there is insufficient evidence supporting social capital acting as a driver for innovation without the appropriate economic stimuli and suggested further empirical-theoretical research to explore the relationship in greater depth.

Crescenzi et al., (2013 p. 924) offers a different perspective, stating that social capital is '*an important predictor of innovative performance*' and argues for innovation policies to take social capital into account. Through discussion earlier

in the chapter, innovation is seen as a contributory factor to sustainable development. This is supported by Capello & Faggian (2005) who argue that social and relational capital stimulates personal relationships and the flow of knowledge within networks (Crescenzi, Gagliardi and Percoco, 2013). Figure 4.5 shows the difference in the channels of knowledge diffusion relating to physical and relational space. Both the physical and relational proximity channels are closely linked to clusters and cluster policy, with the physical aspect manifesting itself through geographic proximity, and the relational channel linking to social capital.

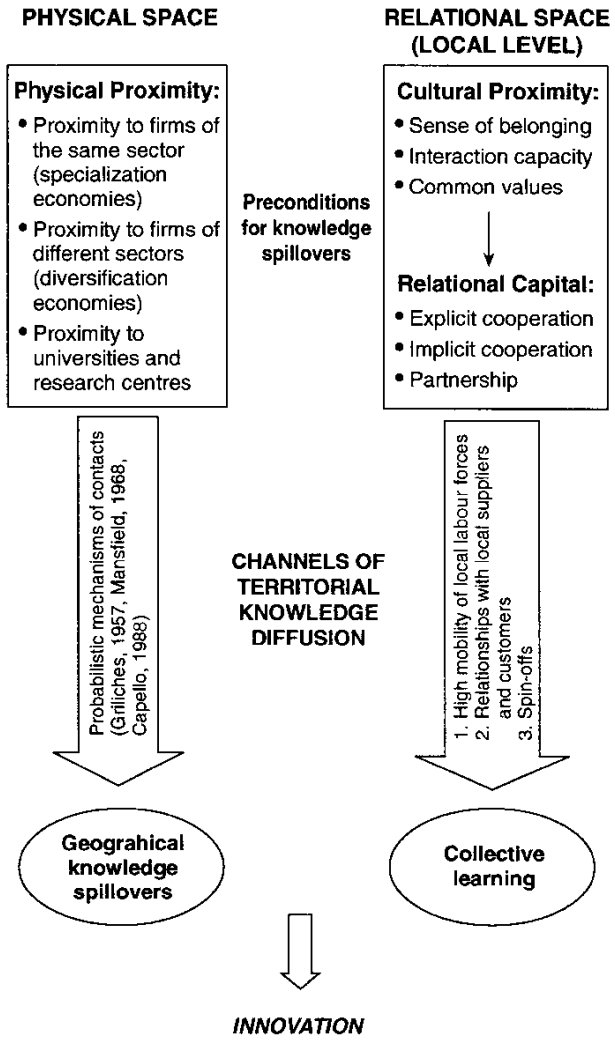

Figure 4.5 Physical and Relational Space
Source: Capello and Faggian (2005)

There are clear links between the preconditions identified in Figure 4.5 in terms of relational space, namely cultural proximity and relational capital and the core aspects of social capital. As a result, if the development of those preconditions is founded in social capital and in turn are necessary for collective learning and subsequently innovation, it is argued that social capital can play a significant role in the innovation process.

It is argued that social capital, specifically 'bridging' social capital and Granovetter's (1973) theory of weak ties, that serves to join otherwise separate groups, in turn spreading knowledge over a wider area. The theory of weak ties is used to support the impact of social capital over a network, rather than strong ties, as strong ties tend to result in relationships where only redundant knowledge is shared (Crescenzi, Gagliardi and Percoco, 2013). This leads to the last of the hypotheses, H4:

> **H4: Social capital has a mediating effect on the relationship between cluster governance and sustainable development within maritime cluster associations.**

This sharing of redundant knowledge is cited as a weakness of networks exhibiting strong social capital in that it can result in 'collective myopia' with networks ignoring external competitors and developments, actually serving to discourage innovation and entrepreneurial behaviour (Inkpen and Tsang, 2005; de Vaan, Frenken and Boschma, 2019). As a result, social capital is both a positive and negative force on innovation and entrepreneurship within communities. It is argued that firms are less likely to enter a region, or for existing firms to exhibit 'deviant' entrepreneurial behaviour, in regions that has strong

social capital than regions with little social capital argued to be a negative influence on 'deviant' entrepreneurial behaviour (de Vaan, Frenken and Boschma, 2019). As a result, social capital is not the defining factor that encourages innovation and entrepreneurship, but instead something to be exploited once the network starts to develop.

4.7. Reverse Relationships

The study recognises that there may be feedback loops between the constructs. As cluster governance contributes to the development of social capital, social capital may act to reinforce the effectiveness of governance activities (Górriz-Mifsud, Secco and Pisani, 2016; Yi, 2018). Similarly, as firms benefit in aspects of sustainable development as a result of cluster governance and increased social capital, the logic of membership is reinforced, meaning that more investment is made in participation by firms, which in turn may further enhance those aspects of sustainable development.

The effects of these feedback loops are excluded from this study as they are likely to occur over an extended period of time. Studies examining reverse causality often use longitudinal data (Moaniba, Su and Lee, 2018; Leszczensky and Wolbring, 2019). This requires a longitudinal study of the cluster associations and is therefore outside the scope of this research. It is recognised that this is a limitation; this is discussed further in section 10.2.

4.8. Research Gaps and Research Questions

Despite the extensive body of literature examining clusters, a number of gaps remain. There are numerous studies that link cluster organisations with the development of cluster governance, social capital and sustainable development,

but there appears little empirical evidence linking the three concepts. There instead appears to be focus on links between clusters and regional performance, innovation and entrepreneurship. Indeed, there is no one single unifying theory that ties all aspects together. Maritime cluster literature typically focuses on their potential development; structures; or economic benefits. Studies have examined governance in the maritime cluster context (De Langen, 2004), but there appears to be little recent emphasis on governance within the cluster organisation context. Whilst clusters have been cited as a key part of maritime growth strategies, there is less emphasis on how cluster organisations should be operated. The lack of a clear governance model for maritime cluster organisations is potentially problematic for managers given the breadth of firm heterogeneity in maritime cluster associations.

Based on the review of literature presented in Chapter 3, nd the theoretical framework examined in Chapter 4, the research questions shown in Table 4.5 have been identified:

Number	Research Question
1	What is the relationship between the perception of cluster governance and sustainable development in maritime cluster associations?
2	What is the relationship between the perception of cluster governance and social capital in maritime cluster associations?
3	What is the relationship between the perception of social capital and sustainable development in maritime cluster associations?
4	Does social capital have a mediating effect on the relationship between cluster governance and sustainable development in maritime cluster associations?
5	What are the critical factors and relationships that support effective cluster governance in maritime cluster associations?

Table 4.5 Research Questions
Source: Author

4.9. Research Hypotheses

Hypotheses have been shown throughout this chapter, aligned to the theoretical arguments and academic literature, they are summarised in Table 4.6.

Main Hypothesis	**Sub-hypotheses**
H1: A positive perception of cluster governance enhances sustainable development within maritime cluster associations	H1a: A positive perception of normative governance enhances sustainable development within maritime cluster associations H1b: A positive perception of cognitive governance enhances sustainable development within maritime cluster associations H1c: A positive perception of political governance enhances sustainable development within maritime cluster associations organisations
H2: A positive perception of cluster governance enhances social capital within maritime cluster associations	H2a: A positive perception of normative governance enhances social capital within maritime cluster associations organisations H2b: A positive perception of cognitive governance enhances social capital within maritime cluster associations organisations H2c: A positive perception of political governance enhances social capital within maritime cluster associations organisations
H3: A positive perception of social capital enhances sustainable development within maritime cluster associations	H3a: A positive perception of structural social capital enhances sustainable development within maritime cluster associations H3b: A positive perception of relational social capital enhances sustainable development within maritime cluster associations o H3c: A positive perception of cognitive social capital enhances sustainable development within maritime cluster associations
H4: Social capital has a mediating effect on relationship between cluster governance and sustainable development within maritime cluster associations	

Table 4.6 Research Hypotheses

Source: Author

There appears little consistency over terminology relating to ‘good’ or ‘positive’ governance in the cluster governance literature. For the purposes of this research, the term ‘positive perception’ is used. This approach is consistent with other governance-related research and provides a good descriptor of what is being assessed. This research is focused on governance as it is perceived by cluster members, rather than whether the governance framework exists. Perceptions of governance are generally accepted as a proxy for governance (Abbey, Tomlinson and Branston, 2016).

The hypotheses were initially tested by way of interview during the preliminary qualitative phase. Along with the theoretical links, this test provided proof of concept before the main quantitative phase was pursued. The testing of a model across several countries provides stronger indication of its external validity, and therefore its applicability in different settings (Sousa, Martínez-López and Coelho, 2008).

4.10. Summary and Conceptual Model

This chapter has examined the relationships between the variables and presented the theoretical framework used in this research. Whilst it is recognised that there is no single unifying theory that underpins the framework, there is sufficient theoretical and empirical research that supports each of the individual relationships being tested. As a result, the conceptual model presented at the start of this chapter has been confirmed.

The conceptual model provides the structure that the researcher believes best demonstrates the phenomena under investigation (Camp, 2001). Often

presented in graphical form, the conceptual model shows the key variables and assumed relationships between them (Miles, Huberman and Saldana, 2014). Based on the theoretical framework outlined in this chapter the conceptual model presented in section 4.1 has been confirmed and is repeated here as Figure 4.6.

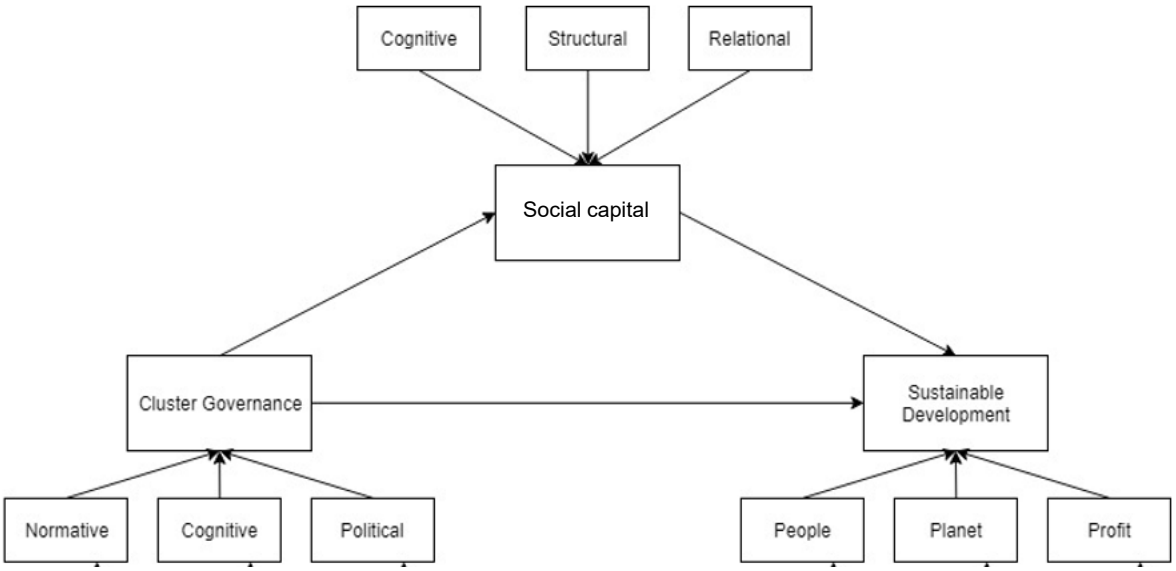

Figure 4.6 Conceptual Model
Source: Author

Acting as both service provider (logic of membership) and collective voice (logic of influence), clusters can contribute to regional competitiveness. In order to achieve this, member firms must take an active role in cluster activities. A diverse range of interests and needs amongst member firms can weaken cluster organisations' abilities to deliver potential benefits (Tomlinson, 2012). Even when firms have interests in common, firms that take a passive role in cluster membership, either due to apathy towards the cluster, perceived dominance by a minority, free-riders gaining benefits from others' efforts, or lack of resources to engage, can result in the collective action problem undermining cluster performance.

The conceptual model indicates that cluster governance, formed of three sub-dimensions, normative, cognitive and political, will have a positive effect on both social capital and sustainable development. Social capital is formed of three sub-dimensions; cognitive, structural, and relational, whilst sustainable development is formed of people, planet and profit sub-dimensions.

Social capital is also argued to have a positive impact on sustainable development, whilst also acting as a mediator in the relationship between cluster governance and sustainable development.

Chapter 5. Methodology

5.1. Introduction

The thesis has so far covered the maritime cluster research context, reviewed cluster governance, social capital and sustainable development literature, resulting in conceptualisation of constructs used in this study, and examined linkages and relationships between them. The thesis now focuses on the methodology and methods used in the study. Methodology and methods may be considered as being different faces of same coin; they are described by Kinash (2013 p. 6) as follows: methodologies are the "*approaches and processes of our research. Methods are the specific ways in which we go about collecting our research data".*

This research adopted an exploratory sequential design, resulting in the first phase of the research, referred to hereafter as the 'preliminary qualitative phase', being focused on collection of qualitative data to support the development of the research instrument used in the subsequent quantitative phase. There is support across related literature for use of this type of research design (Dubey et al., 2015; Sipe, 2016; Zhao et al., 2016; Muhammad et al., 2019; Jeevan et al., 2019; Bimha, Hoque and Munapo, 2020). As a result of this structure, the methodology used in this research is divided into three chapters: this chapter focuses on the overarching methodological issues, examining theoretical foundations of the research, and tying together philosophical underpinnings, research approaches, strategies, and ethical considerations. Chapter 6 then examines the data collection and analysis techniques used in the preliminary qualitative phase, including objectives of the phase, data collection methods, sampling, and data analysis. Similarly, Chapter 7 examines such issues present in the quantitative phase of the research.

5.2. The Philosophy of Research

The philosophy of research underpins the belief systems with which researchers use to guide and undertake research (Guba and Lincoln, 1994). The philosophy of research is underpinned by ontology and epistemology. Ontology refers to the assumptions made about the nature of reality and what is deemed to be a fact (Blaikie and Priest, 2018). This gives rise to the fundamental question of whether social entities are to be viewed as objective or subjective, An objectivist, or positivist, stance views the existence of social entities as external to and independent from social actors, whereas the subjective, or constructivist, approach views social phenomenon as being created as a result of those social actors actions (Easterby-Smith, Thorpe and Jackson, 2008; Saunders, Lewis and Thornhill, 2016).

This research is focused on examining the relationships between perceived cluster governance, social capital and sustainable development; this position has the effect of blurring the distinction between the objective (measurable facts) and the subjective (interpretations). Given the effect of ontology on the overall research design, it is of critical importance that the correct identification is made at the start of the process. The nature of social capital can give rise to the argument that it is socially constructed and open to the effects of interpretation, and therefore more subjective in nature. Cluster governance is more objective in nature as there is a direct cause and effect relationship between the operation of governance and its effect. There is again blurring of distinction between the objective and subjective in regard to sustainable development. Some aspects are clearly measurable, for example return on investment or reduction in non-renewable energy, but more subjective in aspects such as flexibility in strategic outlook.

As a result, an ontological position between pure objectivism and subjectivism has been adopted. It is recognised that some of the constructs will be derived from interpretations of the participants, especially relating to social capital, but factors of sustainable development and cluster governance can be measured more objectively.

This position is likely to result in a more time-consuming approach, especially in obtaining the confirmation of variables in the preliminary qualitative phase, it is believed that the more objective ontology adopted will result in a generalizable set of cause-and-effect relationships useful to future policymakers.

The epistemological position of the research is seen as the fundamental set of assumptions about the theory of knowledge and methods used to examine the nature of reality. The combination of ontology and epistemology forms the philosophical position that underpins the research design used by the researcher to achieve a sound outcome.

A positivist approach emphasises objective scientific methods in the form of the collection of quantitative data and hypothesis testing; it assumes a similarity between the natural and social sciences in terms of methodological principles. Given the intention of this research to establish cause and effect relationships valuable to policymakers, the interpretivist position is rejected. Having established an ontological position more objectivist in nature, and an epistemological position more positivist in nature, it is necessary to establish the methodological framework underpinning the data collection and analysis methods.

5.3. Framework

The philosophy of research demonstrates the assumptions held by the researcher of the way their world is constructed (Saunders, Lewis and Thornhill, 2016), and are fundamental to the design of the research, and can have significant impact on quality (Easterby-Smith,

Thorpe and Jackson, 2008). The following sections address the philosophical underpinnings and strategic issues relating to the methodology; specific operational aspects relating to the qualitative and quantitative phases are examined in Chapter 6 and Chapter 7.

5.3.1. Research Paradigms

A research paradigm is a set of principles dictating 'what should be studied, how research should be done, how results should be interpreted…' (Bryman, 1988 p. 4). It is a framework that is based on the assumptions of the nature of knowledge that are held by the researcher (Collis and Hussey, 2009).

Paradigms range from the objectivist to the constructivist, varying from a reality that is external from social actors (positivism) to those that are generated through social interaction (constructivist). Aligned with these paradigms is that of pragmatism, an approach whereby advocates argue that multiple realities exist, therefore requiring a variety of approaches. The researcher has some sympathy with the pragmatist movement, although cannot reconcile the notion of multiple realities (Howell, 2013).

Positivism emerged in the mid-1800s with the work of Auguste Comté, who proposed that social sciences could be built on the same fundamental notions of the natural sciences. Through observation, immutable laws of cause and effect would explain human behaviour, without recourse to 'hidden' emotions or underlying explanations (Howell, 2013). As a result, positivism allows for hypotheses to be generated and tested and for knowledge to be generated through the collection of facts in a value-free manner (Bryman and Bell, 2011).

Epistemologically, positivism requires complete separation of researcher and the external world. The ontological position of positivism can be considered as one of naïve realism; i.e. that an external reality exists and can be totally understood (Howell, 2013).

Post-positivists argue that whilst an external reality exists, it can at best only be understood imperfectly and that so-called immutable laws can never be proven, only falsified – the ontological position. Popper argued that social situations must be analysed in the social sciences to provide explanations, especially given the difficulty in falsifying theories (Popper, 1994, cited in Howell, 2013). This results in generalisation – the movement away from the subject being analysed to anyone sharing the same situation.

The ontological position of post-positivism has been described as ‘critical realism’ (Bhaskar, 2008). Critical realism defines knowledge as existing in two forms – transitive and intransitive. Transitive objects of knowledge are created and evolve as a result of social interaction, whereas intransitive objects are simply discovered. It can be argued that whilst critical realism can be rejected in the social sciences given a lack of intransitive knowledge, it is possible for the critical realist position to exist (Howell, 2013).

Theories are tested through measurement in a manner similar to positivism, although epistemologically, total separation between researcher and the external world is removed. Table 5.1 summarises the post-positivist approach and implications for the design of the data collection and analysis stages.

Research Paradigm	Ontology	Epistemology	Methodology	Inquiry Aim	Data Collection Methods
Positivism	Belief in single identifiable reality that can be measured.	Belief in total objectivity; researcher and the investigation are totally separate.	Typically quantitative experiments. Belief in the falsification principle. Quantitative	The ability to predict and control natural phenomena. Application of laws.	Experiments
Post-positivism	Reality exists, but unable to fully understand it because of a lack of absolutes. Theory tested through measurement	Minimal interaction, although total separation removed; validity drawn from peers, not research subjects.	Researchers attempt to ask more questions than positivists due to unknown variables. Attempt to approximate reality. Quantitative	Aim to get as close to the answer as possible; approximate reality.	Surveys Experiments
Constructivism	Multiple realities exist, relate to the individual. Knowledge is constructed through experiences and interactions.	Philosophical belief that understanding of reality is constructed by individuals and that researcher and subject of investigation are linked.	Create consensus through individual constructions. Qualitative	Understand and interpret meaning of phenomena.	Case studies Interviews Ethnography
Pragmatism	External, multiple realities; view chosen that best enables the research question to be answered.	Focus on the concept of inquiry as the process of knowledge-seeking.	Mixed methods: uses paradigms and methods that appears to fit the problem.	Combining facts and words/meanings to solve problems.	May use positivist and constructivist methods Interviews Surveys

Table 5.1 Summary of Research Paradigms
Source: Author, based on Lincoln et al., (2011); Creswell & Plano Clark, (2011); Howell, (2013); Grimstad, (2013)

A post-positivist paradigm of inquiry has been adopted as it is believed that the data collected during the different phases of the research will provide for a more complete understanding of the relationship between cluster governance, social capital and sustainable development. The study employs critical realism to examine the complex nature of business relationships and networks, as unlike more positivistic approaches, it does not view such networks as being governed by law-like regularities (Ryan et al., 2012).

Whilst there appears to be a relatively small body of literature discussing critical realism in the cluster context, there is support for its use, most notably round conditions for cluster development (Isaksen, 2016). Further support may be offered by supply chain management literature, where it is argued that critical realism brings together links between the behaviour of organisations, individuals, and related geo-historical factors (Adamides, Papachristos and Pomonis, 2012); this latter point can be related back to that of critical realism in business and management adopted by Ryan et al., (2012).

Within the critical realist perspective, it is necessary to clearly define the processes and methodological approach by which the investigator will carry out the research (Howell, 2013). The research employed the exploratory sequential research design, shown in Figure 5.2 Exploratory Sequential Research Design resulting in numerous methods being investigated for the different phases.

5.3.1.1. Practical Implications of Critical Realism

Whilst the rationale for the use of critical realism was considered in the previous section, focus now turns to practical implications of its use in this research. Pratt (1995) highlights three key areas for consideration: the first is that the research

process is an iterative one, i.e., the model is refined throughout the process; the second refers to the analysis process; whilst the final point concerns the use of retroduction. Each of these points is now considered in turn.

The purpose of the preliminary qualitative phase was to refine an existing set of empirically tested relationships into a theoretical model encompassing cluster governance, social capital and sustainable development. Further refinement occurred during pilot tests in the quantitative phase, then through PLS-SEM analysis.

There is some debate in the literature as to the analytical process used within the critical realist approach; it is argued that techniques such as content analysis could lead to researcher bias being introduced into the process, whereas other qualitative approaches such as discourse analysis may be considered as too open, focusing too much on *how* things are said, rather than *what* is said (Pratt, 1995). Grounded theory has been proposed as an appropriate technique, enabling creation of codes and themes from analysis of empirical data (Hu, 2018), there is an argument that grounded theory's active avoidance of existing theory means that it is not suitable within critical realism (Fletcher, 2017). Grounded theory does not fit with this research as the preliminary qualitative phase is concerned with refinement of existing theory, rather than the theory-inducing aim of grounded theory; as a result, template analysis was used in this study, and is discussed further in section 6.8.1.

The final point concerns retroduction, defined by Olsen (2007) as the reasoning why things happen the way they do, with a goal of identifying the *necessary contextual conditions for a particular causal mechanism to take effect and to*

result in the empirical trends observed" (Fletcher, 2017 p. 189). By combining findings from the preliminary qualitative phase and PLS-SEM analysis, it was possible to identify the contextual conditions required.

5.3.2. Research Approaches

There are two fundamental research approaches available to the researcher: inductive and deductive. The deductive approach tests existing theory through the development and testing of hypotheses so as to explain the causal relationships between variables, typically through the use of quantitative methods (Bryman and Bell, 2011; Saunders, Lewis and Thornhill, 2016).

Inductive approaches are typically associated with qualitative research, whilst deductive approaches are typically linked to quantitative research. The deductive method informs the researcher of the truth about the deductive process, but not the premise on which the process is based (Ormerod, 2010). Deduction can examine the relationship between theory and empirical observation. The main focus of this research is to test existing theory within a 'new' context, that of maritime cluster associations. The deductive process starts with theory in the form of hypotheses, which are subsequently compared to the empirical evidence. Whilst the outcome of that process may be seen as confirming (or disproving) the hypothesis, it has been argued that this is too simplistic, and that other hypotheses could explain the same evidence – the argument that correlation does not equal causation. Karl Popper accepted that knowledge is developed within a community of scientists building on related work, rather than independent logic, due to individual conclusions being based around premises usually outside the control of the researcher (Ormerod, 2010).

This means that some degree of inductive logic is required in the research design process. The inductive approach is a process that starts with the researcher collecting data to draw generalizable inferences relating to the phenomena under investigation (theory); it is an iterative process whereby the researcher will move between theory and data (Bryman and Bell, 2011). Empirical research findings form the basis for the development of theoretical findings (Eriksson and Kovaleinen, 2008). The inductive approach leans towards investigating why a particular phenomenon is occurring, as opposed to the deductive approach that states what is happening (Saunders, Lewis and Thornhill, 2016).

Whilst this research used both qualitative and quantitative approaches the overarching research approach was quantitative. Quantitative research designs are normally associated with the gathering of data in quantifiable terms before producing theory-led deductions (Easterby-Smith, Thorpe and Jackson, 2008). Using the five stage process of quantitative design shown in Hunter (2013), Figure 5.1 shows the design process for this research.

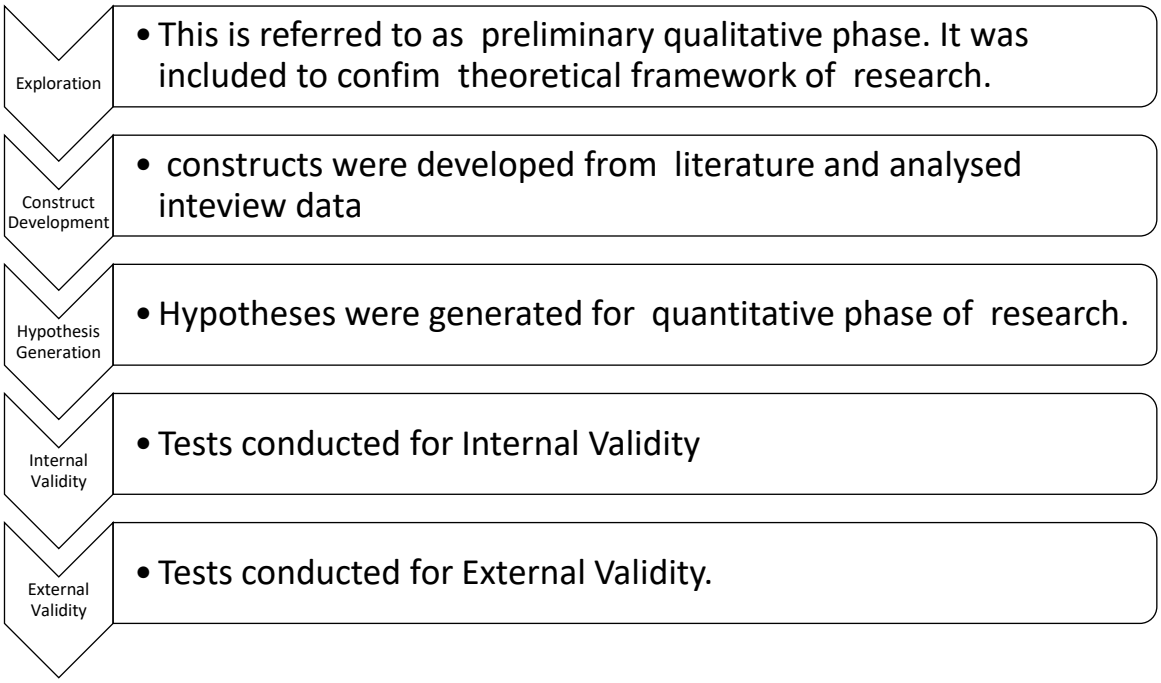

Figure 5.1 Quantitative Research Design
Source: Author, based on Hunter (2013)

The study examined the relationship between cluster governance, social capital and sustainable development in MCOs. The research was conducted in in two phases; the preliminary qualitative phase of the research focused on confirming the literature and developing the research instrument following an examination of the theoretical issues in the maritime context, whilst the quantitative phase focused on confirming the relationship between the factors. Whilst the preliminary qualitative phase employed inductive logic in the confirmation of the research instrument, this formed a relatively small part of the overall research project. As a result, the testing of hypotheses in the quantitative phase was of greater significance, meaning that the deductive approach was appropriate.

5.3.3. Research Strategies

There are a number of research strategies available to the researcher, both within the qualitative and quantitative approaches. Research strategies relate to the methodological 'link' between the underpinning research philosophy and choice

of data collection and analysis techniques (Saunders, Lewis and Thornhill, 2016). The choice of research strategy therefore depends initially on two factors; the philosophy of the research, and the inductive or deductive approach adopted.

Experiments and surveys tend to be linked to deductive, quantitative research, whilst grounded theory and action research are associated with the more interpretivist, inductive research. These considerations, together with the prevalence of surveys in business and management research, have led to the adoption of the survey method in this research.

Surveys normally take the form of structured questionnaires which enable analysis using descriptive and inferential statistics. This allows for the modelling of relationships between variables (Saunders, Lewis and Thornhill, 2016); an outcome this research is seeking. Whilst a structured questionnaire will be the primary research instrument for this study, the survey approach also allows for other methods of data collection including interviews.

Interviews typically allow for topics to be explored in greater depth than questionnaires; this fits with the nature of the preliminary qualitative phase of this study where the theoretical framework of the research was to be confirmed, and the primary research instrument (questionnaire) framework developed.

A number of design choices for using quantitative and qualitative research methods can be found in the literature; this study used the exploratory sequential design, shown in Figure 5.2. Creswell and Plano Clark (2011) argue that this approach is useful when a second, quantitative phase based on the qualitative phase is needed. This is the case in this research.

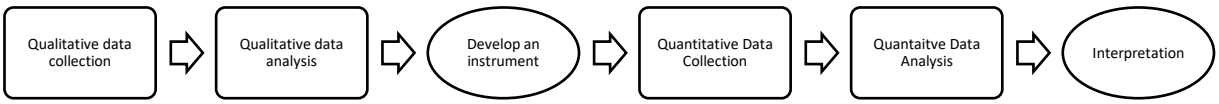

Figure 5.2 Exploratory Sequential Research Design
Source: Author, based on Creswell and Plano Clark (2011 p. 124)

The approaches of grounded theory, action research and discourse analysis were considered for the preliminary qualitative phase. These approaches were discarded in favour of template analysis (more detail is in section 6.8.1); this approach was considered to be more closely aligned to the purpose of the phase, and the existing body of knowledge, and with the requirements of critical realism (see section 5.3.1.1.). Template analysis is an analytical approach rather than a specific methodology which uses *a priori* themes developed from the existing literature (King and Brooks, 2017). The use of *a priori* themes enabled the researcher to gather the experiences of cluster managers and practitioners and develop sector-specific themes, whilst being cognisant of work emerging from other disciplines.

Using the model that emerged from the preliminary qualitative phases, an online and postal questionnaire was developed and distributed among members of maritime cluster associations. Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to confirm or reject the hypothesised relationships. There has been a significant increase in the use of PLS-SEM in business research, especially in research examining causal relationships between constructs and variables (Hair, Ringle and Sarstedt, 2011). The process was carried out between November 2015 and September 2017, including interviews, questionnaire development, the pilot study and the final questionnaire-based survey; this is shown in Figure 5.3.

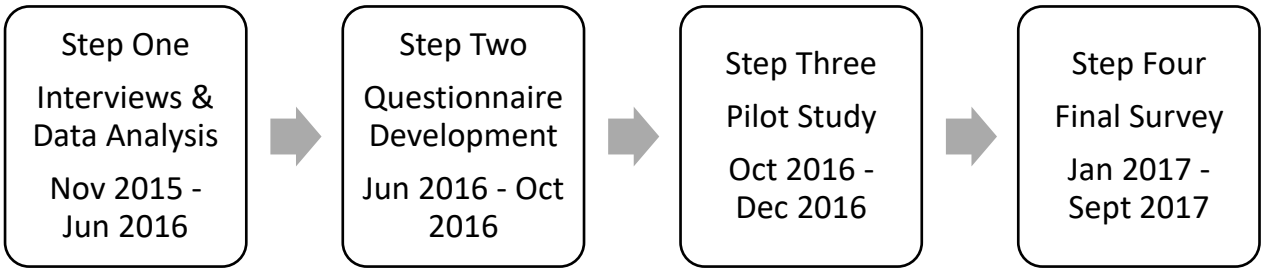

Figure 5.3 Data Collection Process
Source: Author

Further details of the phase-specific methods can be found in Chapter 6 and Chapter 7.

5.3.4. Data Types and Sampling Techniques

Sampling strategies fall within two categories: probability sampling and non-probability sampling. Probability sampling refers to methods used to obtain randomly collected samples, and includes simple random, stratified random, systematic random, cluster, and multi-stage sampling. Non-probability methods include convenience, purposive, quota and snowball sampling. Sampling strategies fall within two categories: probability sampling, and non-probability sampling. Probability sampling refers to methods used to obtain randomly collected samples, and includes simple random, stratified random, systematic random, cluster, and multi-stage sampling. Non-probability methods include convenience, purposive, quota and snowball sampling (Easterby-Smith, Thorpe and Jackson, 2008). It is normally not possible to obtain data from the total population; therefore a sampling method that supports the research objectives in a pragmatic and efficient manner should be adopted (Saunders, Lewis and Thornhill, 2012).

Purposive sampling was adopted for both the preliminary qualitative and empirical quantitative phases of the research. This section provides an

examination of purposive sampling, with specific phase-related issues covered in sections 6.3 and 7.4.

Purposive sampling is defined as the process by which subjects are chosen based on their particular knowledge and expertise and are in the investigator's judgment particularly relevant to the research (Sarantakos, 2005). A non-probability sampling approach was used in this research as it enabled the researcher to select subjects who were best placed to address the purpose of the preliminary qualitative phase, and who met the criteria established for the quantitative phase. There is support for purposive sampling across the cluster literature (Staber, 2009; Kohpaiboon and Jongwanich, 2013; Hartono and Sobari, 2016; Gray and Jones, 2016; Rahman and Kabir, 2019).

The adoption of purposive sampling gave rise to limitations of the research: the first is that whilst theoretical saturation was reached early in the preliminary qualitative phase (see section 6.3), the opportunity to establish a differing opinion may have been affected by the choice of interview subjects; the second limitation is that clusters were chosen for the quantitative phase based on a set of criteria. As a result of the choice of criteria, clusters were excluded who may have provided a different response; the final limitation is that firms outside the cluster were excluded from participation. This will limit the ability to establish whether firms may perform better in sustainable development terms by not being a member of the cluster.

Phase-specific aspects, including limitations, are discussed further in sections 6.3 and 7.4.

5.3.5. Time Horizon

There are two types of time horizon: longitudinal and cross-sectional. Cross-sectional studies are those limited to a specific time-frame, whereas longitudinal studies are repeated over an extended period (Saunders, Lewis and Thornhill, 2016). This study adopted the cross-sectional approach. Whilst it is understood that this means that data collected only reflected a specific point in time, the range of sampled clusters helps to mitigate against potential skewing of results.

5.4. Ethical Considerations

Research ethics relate to the 'standards of the researcher's behaviour in relation to the rights of those who become the subject of a research project, or who are affected by it' (Saunders et al., 2012 p. 680).

Case study researchers are particularly prone to the problem of attempting to use their research to confirm a preconceived position. This is due to many such researchers having a strong understanding of the issues before commencing the empirical stage (Yin, 2014).

The following principles of ethical research as identified by Denscombe (2002), Sarantakos, (2005) and Yin (2014) were met during this research with approval obtained from the university's ethics committee:

i. *Informed consent*: Subjects were told of the nature and purpose of the study, that their participation was voluntary and that they could withdraw at any time; correct information was provided in order for them to make their decision.
ii. *Protection from harm, including deception*: None of the research exposed participants to the risk of physical harm; the risk of mental

harm was deemed to be of minimal risk given the nature of the questions contained in both the survey and interviews – experimental studies formed no part of this research. The objectives of the survey and interviews were clearly identified at each appropriate stage and at no point were participants misled over the purpose of their participation.

iii. *Privacy, anonymity and confidentiality*: This research focused on the business/social activities of participants; questions of a particularly personal or sensitive nature were avoided. The background of subjects was not relevant to this research so no information was sought or obtained pertaining to this. Anonymity was offered as part of the request to participate and was standard for the survey element; anonymity was granted for anyone who requested it. Results of the survey were published in such a manner as to avoid the potential for them to be linked to any individual.

iv. *Equitable selection*: The survey aspect of the research used stratified random sampling to select the sample; no group of people or organisations were unfairly included or excluded from the research.

This research project was approved by the Plymouth University Faculty of Business Research Ethics Committee on 14 August 2015 ref. REC1415.62. Phase-specific ethical considerations are addressed in sections 6.4 (preliminary qualitative phase) and 7.7 (quantitative phase).

5.5. Overall Research Design

This chapter established the philosophical position and the general approach adopted in this research. It lays the foundations for the qualitative and quantitative phases of the exploratory sequential research design employed.

The chapter established that the post-positivist paradigm of inquiry was adopted given the incomplete nature of knowledge and inability to develop immutable laws. The epistemological approach of critical realism is an inherent part of research of this type. Interviews to refine the survey instrument were discussed, before the relationship between the philosophical position and survey instrument itself was explored; both were consistent with the post-positivist, critical realism position.

Chapter 6. Preliminary Qualitative Phase

6.1. Introduction

This chapter presents details of the preliminary qualitative phase of the research, including the interview stage and template analysis used for the analysis of the data.

6.2. Semi-Structured Interviews

Semi-structured interviews were conducted in order to confirm the attributes of social capital, sustainable development and cluster governance. These interviews were conducted with practitioners drawn from the Cornwall Marine Network, Mersey Maritime and Maritime London in late 2015. The interview schedule was developed following the literature review and was intended to test the concepts in a maritime context that were drawn from predominantly non-maritime literature. Prior to the interview process commencing, a pre-test was conducted within the Graduate School of Management. This was done to provide experience of the approach; the identification of potential issues with the research instrument and subsequent analytical methods; an appreciation of the way interviewees may understand and respond to questions; the flow of the questions; and other logistical issues (van Teijlingen and Hundley, 2001; Bryman and Bell, 2011; Kim, 2011). The questionnaire was also reviewed following the first round of interviews being conducted.

The interviews were transcribed and analysed using the thematic analysis process; the results are discussed later in this chapter.

Semi-structured interviews were chosen so that a standard set of key themes could be addressed, but with sufficient room in each interview to examine

significant replies in greater depth (Bryman and Bell, 2011). Interviews took place in venues chosen by the interviewees. Beyond research textbooks providing guidance on issues such as convenience and comfort, other factors relating to interview location are generally overlooked in the literature (Elwood and Martin, 2000; Braun and Clarke, 2013). Gagnon, Jacob and McCabe (2015) argue that there are two dimensions of interview location: 'space' and 'place', see Figure 6.1.

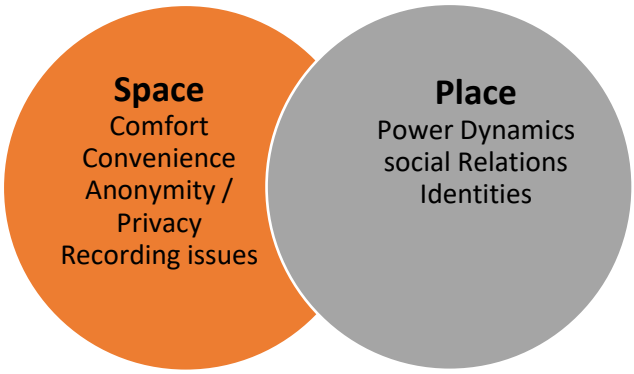

Figure 6.1 Space and Place Dimensions of Interview Location
Source: Author, based on (Braun and Clarke, 2013; Elwood and Martin, 2000; Gagnon, Jacob and McCabe, 2015)

Factors related to space were managed by providing the interviewees with the choice of location, enabling them to select an appropriate setting. Similarly, providing the interviewees with choice reduced potential issues related to power dynamics and interaction with others.

It has been argued that researchers can only gain meaningful data from managers when four conditions are met; 1) manager is able to answer the question as the topic forms part of their work, 2) questions are understandable, 3) the interview itself enables an accurate response to be provided, and 4) there is no incentive for managers to mislead (Winter, 2003). The first point is addressed in the selection of interview subjects, see section 6.3; the second and

third concerns are examined in section 6.5. With the purpose of the interview explained in detail ahead of the interview itself, and through the selection of subjects detailed in section 6.3, all reasonable steps to avoid the fourth point have been taken.

6.3. Selection of Interview Subjects

Purposive sampling was used in the selection of interview subjects. This approach is typical of qualitative research, and appropriate in this research given the nature of this phase (Sarantakos, 2005). Interview subjects were selected from cluster practitioners and representatives from member firms. Representatives were deemed to be those with sufficient knowledge of the cluster, the organisation's relationship with the cluster and the business activities of the member firm. Table 6.1 shows the list of subjects.

Interviewee	Position	Sector
A	Harbour Master	Port Authority
B	Sales Manager	Engineering
C	Head of Marine Operations	Shipping & Engineering
D	Director	Education
E	Chief Executive	Maritime Business Services
F	Director	Maritime Business Services
G	Partner	Maritime Legal Services
H	Owner	Shipowner
I	Senior Business Developer	Cultural Organisation
J	Chief Executive	Cluster Practitioner
K	Legal Director	Maritime Legal Services
L	Chief Executive	Cluster Practitioner

Table 6.1 Interview Subjects
Source: Author

In line with the overall sampling strategy, purposive sampling was used to select interviewees. Purposive sampling is typical of qualitative research (Sarantakos, 2005), and fitted well with the nature of the preliminary qualitative phase. Whilst

the selection of subjects gave rise to potential bias due to the choices made by the researcher, the breadth of organisations represented, and that their involvement was not as a result of influence from their cluster organisations, it is believed that the potential negative effects have been limited.

There are theoretical and practical issues associated with the size of the sample, with Robinson (2014) suggesting that for idiographic research using IPA, the sample size is typically 3-16. Although this study did not use IPA, there is sufficient similarity in the process and the purpose of developing cross-case generalities. The size of the sample was not predetermined, although an indicative number was set at 15, with adjustment possible throughout the preliminary qualitative phase.

This phase ended with 12 interviewees given that data saturation was achieved (Sarantakos, 2005). Data saturation occurs when further data collection fails to reveal new data or themes (Braun and Clarke, 2013; Gentles et al., 2015). Fusch and Ness (2015) advise asking all participants the same questions and including a wider range of interviewees than may be initially obvious.

6.4. Ethical Considerations for the Preliminary Qualitative Phase

Interviewees were contacted by either telephone or email to arrange a suitable time and place for the interview. Informed consent was obtained from each by explaining the nature and purpose of the study, along with a reminder that their participation was voluntary and that they could withdraw at any time. Permission to make an audio recording and written notes was also requested. Interviewees acknowledged their consent by signing consent forms; a copy of the form is included as a number of the interviewees requested a list of questions before the

interview took place; this was provided. Where, during the interview, the interviewee requested that a part was off the record, the recording device was stopped, and written notes were not made. Transcripts were sent to interviewees for approval; no reply was assumed to mean acceptance of the transcript.

6.5. Qualitative Validity

Figure 6.2 shows the Qualitative Legitimation Model developed by Onwuegbuzie and Leech (2007). This model shows the range of threats to both internal and external credibility.

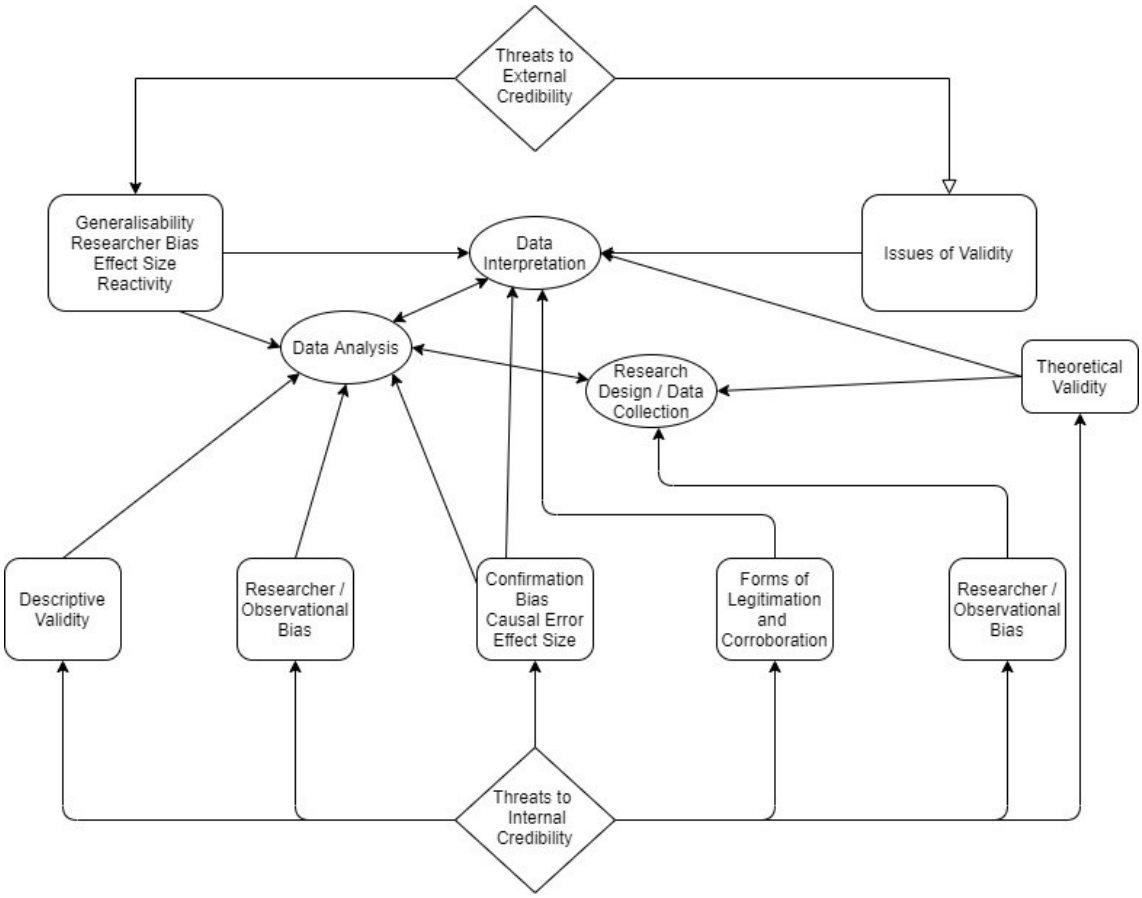

Figure 6.2 Qualitative Legitimation Model
Source: Author, based on Onwuegbuzie and Leech (2007 p. 234)

This model reflects a shift from earlier literature examining rigour in qualitative research; such work often focused on strategies enabling qualitative researchers to demonstrate validity in the outcomes of their work, rather than showing ways in which it could be ensured during the development stages (Morse et al., 2002).

Researcher bias relates to more than the way the questions are asked, and can be both active and passive (Onwuegbuzie and Leech, 2007). Active bias refers to explicit statements and actions that can lead to interviewees being influenced, whilst passive biases reflect the character of the interviewer, status, behaviour and social difference (David and Sutton, 2004).

This research addressed the facets of legitimation explored in Onwuegbuzie and Leech's (2007) paper. Interview data was mapped to existing knowledge though the template analysis approach (refers to rhizomatic legitimation, see section 6.8.1); the semi-structured interview approach allowed for co-existing opposites to be explored and understood (ironic legitimation); and the researcher ensured significant work was complete to fully understand the issues being explored at interview and subsequent analysis (voluptuous legitimation).

Theoretical validity refers to the ability of the researcher to establish agreement on the facts emerging from the data, along with the ability to apply theory to those facts (Maxwell, 1992). These issues were addressed by asking the same questions during the interviews.

Descriptive validity refers to the factual accuracy of the data as documented by the researcher (Maxwell, 1992; Onwuegbuzie and Leech, 2007). The transcription review process (see section 6.7) and use of field notes ensured that

the data presented was as close to what was actually said, in the way that it was said.

There are a number of ways in which the research can be influenced by bias; this includes including poor sample selection, instrument design or research practices (Braun and Clarke, 2013). The use of purposive sampling and recruiting interviewees until data saturation in this research reduced the potential for bias (Smith and Noble, 2014).

Maxwell (1992) argues that qualitative researchers are not simply concerned with what people say, but also with the underlying meanings of the words and behaviours of the interviewees. Field notes supported the transcripts to ensure this information was not lost.

Using smaller samples to generalise rather than to understand underlying principles should be avoided as they are typically not representative (Onwuegbuzie and Leech, 2007). No attempt was made in this phase to generalise across different populations, locations or contexts; instead, the findings were used to confirm existing theory drawn from the literature.

6.6. Interview Questions

The research relates to the relationship between cluster governance, social capital and sustainable development. Questions emerged following a review of the literature from chapters 2-4, emphasis on the nature of interaction, perceived benefits and sustainable development. Questions related to cluster governance were explored within each of these areas.

The main interview questions are shown below:

1. What are the benefits of belonging to the cluster?
2. How do you interact with other local organisations?
3. You have talked about the benefits of the organisation belonging to the cluster, how do you quantify the benefits?
4. What does sustainable development mean to you?
5. You have talked about the benefits of belonging to the cluster; how do you see the benefits from a sustainable development perspective?
6. Does belonging to the cluster influence sustainable development in your organisation?
7. Do you have any defined sustainable development goals?

6.7. Transcription

Recording took place using a digital audio recorder. Following the interview, a unique file name was allocated to each file, cross-referenced to the research diary where the name of the interviewee, place and date of interview was recorded. The audio recording enabled transcription to take place.

The quality and reliability of the transcription are fundamental concerns given that transcripts are used for both analysis, and evidence of the analysis (Davidson, 2009). Halcomb and Davidson (2006) present an argument for and against verbatim transcription, highlighting the potential for errors in the transcription process. Professional transcribers were employed to complete the initial transcription given the significant resource implications associated with the transcription process. Following transcription, a quality check compared the written documents with the recorded interview. These transcriptions were checked against the written field notes to ensure that the transcripts accurately

reflected the interview (Fasick, 1977). Sending the transcripts to interviewees formed the final check. This process ensured that the final transcripts were ready for transcription.

6.8. Thematic Analysis

The chosen method of analysis must fit with the philosophical and methodological assumptions made by the researcher (Easterby-Smith, Thorpe and Jackson, 2008). The post-positivist approach adopted in this research will typically involve an examination of the data for particular occurrences and involve the use of techniques such as content or thematic analysis, adopting a blend of pre-determined and emergent codes drawn from the literature and interview stage.

Along with the compatibility between thematic analysis and critical realism, there is also a link between the analytical approach and the initial research questions; it has been argued that thematic analysis is most appropriate when examining the nature of a particular group's perception of a phenomenon being studied (Joffe, 2012).

Whilst arguing that thematic analysis is a method distinct from others, Braun & Clarke (2006) recognise the position adopted by a number of authors who view the thematic coding process as a core skill common to the major qualitative approaches. They argue that thematic analysis is different to other qualitative methods that attempt to find patterns as it is not theoretically bounded (e.g., grounded theory) or attached to a phenomenological epistemology (e.g., interpretative phenomenological analysis).

There are similarities however between the grounded theory method and thematic analysis, except that grounded theory is concerned with the generation

of theory that is grounded in the data, whereas thematic analysis aims to *'identify, analyse and report patterns (themes) within data'* (Braun & Clarke, 2006 p. 79). A further distinction is provided by (Ngulube, 2015) who propose two approaches to thematic analysis; theoretical coding and thematic coding. Theoretical coding underpins grounded theory, whereas thematic coding seeks to develop categories and domains.

The preliminary qualitative phase of this study sought to confirm the themes for the development of the quantitative research instrument. Some researchers have cited the use of grounded theory, without committing to the full theoretical requirements of that method, instead using an approach more closely aligned to thematic analysis (Holloway and Todres, 2003). For this study it was considered inappropriate to use a theoretically cut-down version of grounded theory, instead preferring an explicit and fully acknowledged thematic analysis.

Thematic analysis enables the analysis of different types of data, varying sizes of data-sets and the production of theory-driven analyses (Clarke and Braun, 2013). This is of particular importance given the need in this research to synthesise literature and interview data to produce a theory-driven quantitative model.

There are some issues with the use of thematic analysis. It has been argued that it may be perceived as lacking the substance of theoretically driven approaches, such as Grounded Theory; that it consists of realist descriptions of topics; and that the focus on patterns across datasets can 'hide' the views of individuals (Braun and Clarke, 2013). Despite these concerns, the use of thematic analysis is justified given the positioning and purpose of the qualitative aspect of this study.

Although reasonably, and logically sequential, thematic analysis is not a linear process; it is instead recursive in nature, requiring the researcher to continually look back over previous stages (Braun and Clarke, 2006; Clarke and Braun, 2013). In acknowledging that thematic analysis is not a linear process, Brooks et al., (2015) argue that there are also a number of approaches to thematic analysis, including matrix analysis, framework analysis and template analysis. Template analysis has been used extensively in business, management and organisational research (Doern, 2011; Bastl et al., 2012; Brooks et al., 2015). Nigel King is the principal advocate of template analysis, and it his is work that tends to inform much of the discussion around template analysis.

6.8.1. Template Analysis as a Form of Thematic Analysis

King (2004) identifies two key advantages of using template analysis; it can be particularly flexible to meet the needs of the research, and it is argued to work well in research examining the views of differing groups in an organisational context.

6.8.2. Philosophical Considerations

Template analysis is an analytical approach rather than a specific methodology; this means that it is applicable across a range of research philosophies, with significant responsibility placed on the researcher to justify the relationship between philosophy and method (King and Brooks, 2017). Maxwell (2012) argues that the critical realist approach tends towards the use and development of theory, meaning that the use of template analysis within this approach normally requires theoretically informed *a priori* themes developed from the existing literature (King and Brooks, 2017). Reflexivity in the analysis process is required given that critical realists pursue interpretations of the data that can be influenced

by the subjectivity of the researcher (de Vaujany, 2008; King and Brooks, 2017). Maxwell (2012) argues that researchers within the critical realist approach should assess risk to the interpretation of their data throughout the research process, rather than adopting quality checks typical of other approaches. The strategy for ensuring quality of interpretation was discussed earlier in section 6.4.

6.8.3. The Process of Template Analysis

Template analysis is regarded as a flexible approach that can be used across a range of philosophical positions within qualitative research (Brooks et al., 2015). As a result, there is no one prescriptive method, although there are general principles. The researcher must ensure that the adopted method is consistent with the philosophy of the research (King and Brooks, 2017). Figure 6.3 shows the deductive approach to template analysis that was used in this research; this approach is consistent with the philosophical position of this research.

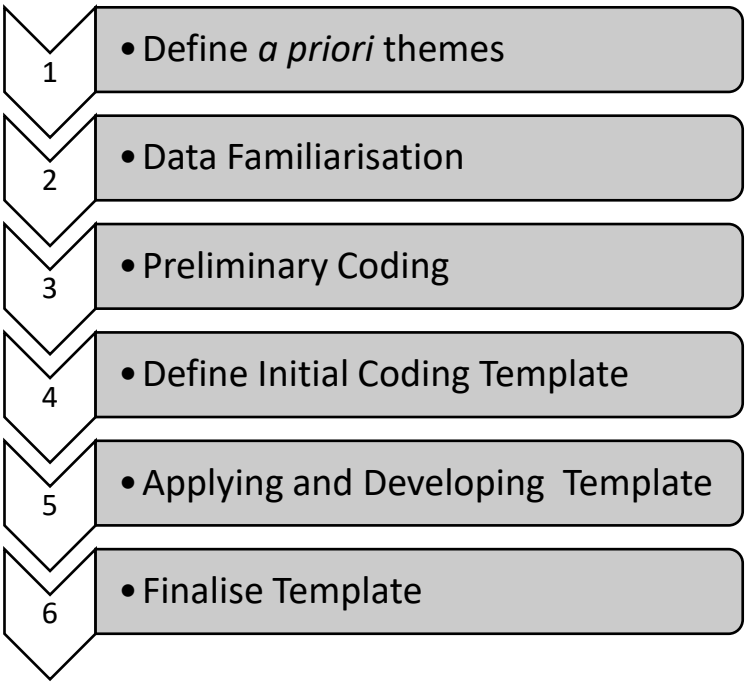

Figure 6.3 Template Analysis Process
Source: Author, based on King (2012); Brooks et al. (2015); University of Huddersfield (2018)

Stage 1: Develop a priori themes

Whilst typical of template analysis, the use of *a priori* codes is not compulsory. *A priori* codes were used in this research given the relatively well-established body of literature available. King and Brooks (2017) proposed a continuum of *a priori* themes from 'hard' to 'soft'. Hard themes are those that are clearly defined and are typical of the critical realist approach. Softer themes represent potential areas of interest within the data. The *a priori* themes used in this research are situated towards the 'harder' end of the continuum. There are two further considerations when using *a priori* themes, that both relate to the adherence to such themes during the analysis process. The first is to ensure that the researcher is not blind to emergent themes, whilst also acknowledging that those predetermined themes may need to be amended or removed (King, 2012; King and Brooks, 2017). Both of these reflect threats to the validity of the research process.

Stage 2: Data Familiarisation

The purpose of this stage is to fully 'immerse' the researcher into the data, involving repeated reading of and listening to the data. An external company conducted the transcription of the interviews. The transcription company signed a Non-Disclosure Agreement to ensure ethical standards were met. This stage is more than 'data familiarisation', the reading process is of a more analytical and critical approach (Braun and Clarke, 2013). Although a level of analysis takes place here, it is less formal and precise than in later stages. Whilst this analysis can be of use, the lack of a systematic approach during familiarisation means that outcomes should not be used as the sole basis of analysis.

Stage 3: Preliminary Coding

This stage of the process relates to the identification of data that relates to the overall aim, objectives and research questions of the study, and is similar to most forms of thematic analysis (King and Brooks, 2017). The coding process begins with trying to identify anything of interest within the data, a process termed 'complete coding' by Braun & Clarke (2013). The identification of potential themes, to sit alongside the *a priori* themes, begins at this stage.

Stage 4: Define Initial Coding Template

The focus at this stage is on the identification of patterns within the data, and subsequent reporting of those patterns. It is the meaning of the identified patterns, rather than their frequency, that is important. Braun & Clarke (2013) introduce saliency analysis, developed by (Buetow, 2010) this approach highlights the premise that items appearing infrequently can be of significant importance. King and Brooks (2017) suggest that unlike other forms of thematic analysis, it is typical practice within template analysis to use a subset of the data to develop the initial coding template. Given the relative ease with which the twelve interviews could be analysed, the preliminary coding in this research used the whole data set. This approach contributed to the overall validity of the phase by reducing the possibility of emergent themes being ignored and modifications to the template not taking place.

This research used hierarchical coding in the development of the initial coding template. The hierarchical coding process groups similar codes into higher order themes, and is typical of template analysis (King and Brooks, 2017). The use of hierarchical coding linked well with using *a priori* themes, which were themselves presented as top and sub level themes.

Stage 5: Applying and Developing the Template

This stage typically involves the application of the initial template to fresh material. As the whole data set in this research was used to develop the initial template this was not possible. The template was applied to the data set again but using a different lens. This iteration of the process was to confirm the template and to ensure any relevant material that had not been included was incorporated, and a check to ensure the relevance of previously included material also took place. This aspect of the process is described by King and Brooks (2017) as the final part of this stage.

Stage 6: Finalise Template

Although this is the final part of the template development, it is not the end of the preliminary qualitative phase. King and Brooks (2017) present three aspects to the final interpretation and presentation of the coded data: examining patterns of themes; prioritising themes; and exploring connections. The examination of the data for patterns can result in an insightful analysis of the themes and provide justification for closer examination. Listing and summarising the findings is a key part of this process. This was especially important in the context of this research as the preliminary qualitative phase was used to justify the themes in the quantitative survey instrument. Understanding the connections between themes can allow for the revision of an existing theoretical model; this was an important consideration given the link to the development of the quantitative phase.

6.9. Findings

Semi-structured interviews were used in the first phase of the research as a means of justifying the themes within cluster governance, Sustainable development and social capital that emerged from the literature in the specific

maritime cluster organisation context, and also to identify any emerging themes. The questions used were based on the literature, but the nature of semi-structured interviews allowed for further probing into developing areas and for the experiences of the participants to come through.

6.10. Conceptual Model Confirmation & Development

Miles et al., (2014) suggest that many qualitative analysts seek to develop a conceptual framework with their research, rather than starting out with one. Whilst cognisant of this perspective, the research conducted through the literature review in this study enabled an initial conceptual model to be developed, and then refined following the qualitative analysis.

The initial conceptual model was used as the basis for much of the rest of this chapter. The initial model was used as the basic analytical structure given that the stated intent of the preliminary qualitative phase was to confirm and refine the conceptual model. As new themes emerged from the qualitative data, so they are included in the relevant section. This chapter continues with an examination of interview findings in the context of wider cluster governance, sustainable development and social capital literature in order to confirm themes that will be used in the quantitative phase. The first of these sections focuses on cluster governance.

6.11. Cluster Governance

The *a priori* themes of cluster governance, shown in Figure 6.4, is based on the model developed initially by Lawrence & Suddaby (2006), and developed by Berthinier-Poncet (2014), with support from Ganescu & Gangone (2012).

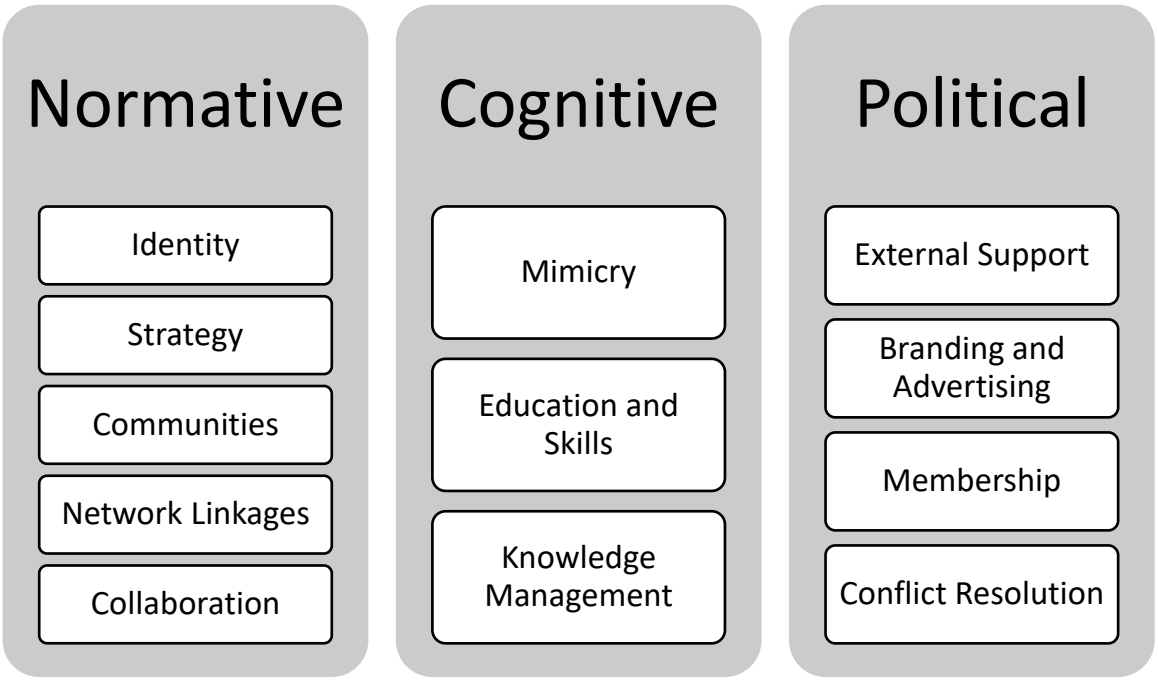

Figure 6.4 *a priori C*luster Governance Themes
Source: Author, based on Lawrence and Suddaby (2006); Ganescu and Gangone (2012); Berthinier-Poncet (2014); Wise, Wilson and Smith (2016)

6.11.1. Political Governance

The political perspective of cluster governance, shown in defines the branding of the cluster, the rules of membership and relates to the ability of clustered firms to interact and access the resources required for innovation (Berthinier-Poncet, 2014).

6.11.1.1. Branding

With brand identity recognised as a means of conveying perceptions of organisations, including culture, personality and unique traits (Devigili, Pucci and Zanni, 2018), it was clear from many of the interviewees that the cluster organisation plays a significant role in the branding of 'maritime' in the region and the range of services offered. Interviewee A was positive about the role of the cluster organisation in raising the profile of the sector *"[they] represent us in different industry sectors. They represent us with politicians…"* This branded

representation took place regionally, "*[they raise] the profile of the sector within the region"* (Interviewee D) *"…domestically and internationally..."* (Interviewee E). This branding also offers *"credibility"* on an international stage (Interviewee F). This supports and contributes to the advocacy practices defined in Berthinier-Poncet (2014). This is largely consistent with literature that has highlighted the role that branding can play in both cluster development (Zamparini and Lurati, 2012), shared understandings, and economic development within a region (Amdam et al., 2020). This is aligned with Lawrence and Suddaby (2006), Berthinier-Poncet (2014), and Wise, Wilson and Smith (2016) upon which *a priori* themes for political governance were based.

6.11.1.2. External Support

The availability of external support, particularly funding and training, that is facilitated by the cluster organisation featured strongly across many of the interviewees: "*they're expert at drawing down funding from all sources"* (Interviewee A); the provision of "…*funding and grant funding and using that channel to help us work on projects…"* (Interviewee C); "*…opens up opportunity for learning events, supporting training and development…"* (Interviewee B); and to help members focus on "…*issues which help those issues* [those that are important to the region] *to develop in the region and helps outside support for those issues"* (Interviewee G). The cluster organisation also facilitates communication – "…*from the region externally but* [also] *what's going on externally locally…"* (Interviewee J). Berthinier-Poncet (2014) highlights the role of practices designed to facilitate acquisition of resources as being a core part of political governance, and in contributing to innovative practices; there is further emphasis on its importance in both Lawrence and Suddaby (2006) and Wise,

Wilson and Smith (2016). This is also consistent with the wider literature, where for example, external support has been found to contribute towards linked to sustainable development (Martínez-Pérez, García-Villaverde and Elche, 2015; Mzembe et al., 2019).

6.11.1.3. Membership

Whilst being a member of a cluster has been acknowledged in the literature as being beneficial to firms, membership in context of political governance relates to strategies for recruiting and selecting members (Berthinier-Poncet, 2014). Membership strategy was not a particularly well-developed theme in the interviews. It was not explored as a governance theme explicitly, although Interviewee J discussed the selective application process, resulting in applications being refused. Additionally, the rules of the cluster organisation mean that "*…90% of the members have to be within the maritime sector"* (Interviewee J). The argument for the membership structure expanding beyond maritime businesses was presented as being twofold: firstly, as a desire to represent the wider region; and that those businesses outside the maritime sector bring benefits to the maritime sector (Interviewee J). A distinction was made between being a membership organisation and an organisation with members that resulted in greater independence without the need to continually seek new members (Interviewee J).

This focus on membership can be linked to aspects of normative governance (discussed in 6.11.2) particularly in terms of local buzz/global pipelines debate. Bathelt, Malmberg and Maskell (2004) argue that an environment comprising organisations with related and complementary knowledge and skills can enable development of a more dynamic cluster. Proximity alone is not sufficient for this

to occur (Rodríguez-Pose and Comptour, 2012); developing right composition and size of membership is therefore important (Klofsten et al., 2015). These findings remain consistent with the model presented as Figure 6.4.

6.11.1.4. Conflict Resolution

The final element of the political aspect of cluster governance relates to the regulatory mechanisms employed to maintain control and for conflict resolution (Grandori and Soda, 1995; Lawrence and Suddaby, 2006; Berthinier-Poncet, 2014) Although touched on by Interviewee J who argued that being a member of their cluster, firms were able to *"rise above that, it's not a battlefield… you all work together to support the industry,"* this theme did not explicitly emerge during interviews. This may be explained by issues such as conflict resolution being internal to the cluster organisation, and not encountered by interview participants directly; that conflict resolution is not explicit within clusters, .e.g. Wise, Wilson and Smith (2016) do not refer to conflict resolution explicitly, instead it could be argued to be part of other functions.

Given this potential inconsistency, conflict resolution was retained for closer monitoring in the quantitative phase. Subsequent analysis could provide further support for removal or retention of conflict management as a measurable item.

6.11.2. Normative Governance

The normative aspect of cluster governance relates to the development of stable interactions between members, leading to the creation of trust and the exchange of information (Berthinier-Poncet, 2014). There are links between normative governance and social capital.

6.11.2.1. Identity and Strategy

The first of the normative elements relate to a common cluster identity and clear strategy, both in development and subsequent communication to members (Berthinier-Poncet, 2014; Nonaka and Konno, 1998; Alvarenga Neto and Choo, 2011). A clear strategy to support the maritime services offered by the region was highlighted by Interviewee E "*it's a very reasonably cost-effective way of having some extra push…"* The clear strategic aim of the respective cluster organisations was supported by other interviewees: "…*we can speak with a little authority…about the state of the industry and where…requirements are going to be…"* (Interviewee J); "*…* [the cluster is] *huge to the region overall…*" (Interviewee H); "…*it's not just about businesses meeting and talking to each other, it's about a collective focus and understanding what the collective focus of the region should be."* (Interviewee G); and from a skills perspective "*matching those skills with what the employers need…"* (Interviewee F). The clarity of strategy stood out in one cluster particularly.

Identity was an important factor: raising awareness of lower-profile organisations (Interviewee E); a common identity (Interviewee A), to the point of becoming part of that organisation once the fee is paid (Interviewee J). The strength of opinion in this area confirms the importance of this to the cluster governance model, although the interviews demonstrated a relationship between identity and strategy, to the point that they should be combined. A shared identity forms the basis for collaboration within a cluster, as an antecedent for growth and can contribute to increasing status for members (Staber and Sautter, 2011), for example firms can benefit from being associated with a region known for its quality (Devigili, Pucci and Zanni, 2018).

This strength is aligned with the *a priori* themes that emerged from the literature and shown in Figure 6.4.

6.11.2.2. Communities

The development of communities appeared to take on two forms through the interviews: the creation of sub-groups; and in the more holistic view of the cluster. These communities are an important part of the development of the cluster as they contribute to the growth of trust and the creation of a shared vision amongst cluster members (Berthinier-Poncet, 2014; Wise, Wilson and Smith, 2016).

Interview J discussed an arrangement with a local university where support was offered to "get student placements, to support them at an engineering school, to work with them on an international strategy [and] to work with them on a maritime knowledge hub". Other interviewees highlighted the creation of a sub-group, facilitated by the cluster organisation, dedicated to renewable energies in the maritime sector (Interviewees A & B). The interviews provided support for retaining the communities theme in the quantitative phase.

6.11.2.3. Network Linkages

Closely aligned to the development of communities, is the development of linkages across the network. These linkages form the initial stages of the trust and shared vision aspects of clustering that are subsequently enhanced through the creation and growth of social capital. This aspect was a prominent part of the interviews; interviewee's key responses related to network linkages are summarised as Table 6.2.

Interviewee	Network Linkages
A	Probably the main benefit is networking with the sector and there are opportunities that come along At a sort of, management level I meet people across the sector on the…group committee. There are hydraulics, parts and service suppliers, there are marine surveyors. So, unless I did business with some of these companies, I wouldn't meet some of the other people.
B	So, for example there's a subgroup… which is all about renewable energy It's attendance of regular communication with… the network…. who makes us aware of events and discussions behind the scenes. And then from that we attend those meetings and talk further about it.
D	It provides us with a linkage to a group of likeminded people that we then work with in various ways.
E	And the answer is I don't want to be left out. I want to be invited. And I would feel bad if, you know the organisation failed because we weren't, among others, we weren't participating.
F	So automatically you're quite heavily involved in the community there
G	It's informal but by its very nature you're exchanging ideas with a common aim to help the… region and it's easier to do that rather than doing it on a one-by-one basis. It does make exchange of information easier.
H	So, you'll have businesses who are really good at stuff but could do with some support from academia, so they might just be a hair's breadth away from designing a new widget for an engine, but they could do with some support from academics from the universities.
I	I think we've just got a better relationship with them, because you know, we see them more often
J	The other tools are, I suppose, as I've just mentioned, they will also, businesses will benefit from those, so, you know, a little SME, a little business can join for 250 quid, and they can phone any of us and say, "Actually, can you tell me what's going on in this sector, I've heard of a tender here, how do I do it, or can I meet [name redacted] or can I meet such and such place, or actually I have a problem with this, or can you help you help me with that?" and we'll say yes.
K	So, you know, the benefits to us, you know, or the benefits generally for members is that it's very collaborative, it's got a very collaborative feel and so, you know, members look out for each other

Table 6.2 Network Linkages
Source: Author, derived from Interview Analysis

There were some variances in the extent to which the linkages were established and used. Interviewee C found greater immediate benefit in personal connections and industry/trade shows, rather than network linkages. This may be due to relatively line connection to the cluster; they did view the cluster as being "*… an avenue where we could go down to look for those* [connections] (Interviewee C).

It was also suggested that the nature of the organisation could influence the network linkages "*but in terms of our interaction with the region, because essentially we are a national organisation, we tend not to focus on the region*" (Interviewee D). Similarly, linkages can be affected by the type of work undertaken by the member firms; clusters that are more homogeneous may have fewer linkages *"… also if you're in… maritime business services you don't use maritime business services very much. You sell them*" (Interviewee E).

The development of network linkages can be associated with effects of both local buzz and global pipelines (Bathelt, Malmberg and Maskell, 2004). Effective facilitation of linkages, especially between generation of knowledge and economic activity can lead to economic development within industrial and service sectors (Hershberg, Nabeshima and Yusuf, 2007). The interview findings are consistent with the model in Figure 6.4 and the related literature.

6.11.2.4. Collaboration

Collaboration forms a fundamental part of cluster policy and practice and is reflected in the cluster governance model. The focus within the model proposed by Berthinier-Poncet (2014) is on developing collaborative projects, supported by both Lawrence and Suddaby (2006) and Wise, Wilson and Smith (2016), however

the facilitators of such projects are an important aspect of governance. Table 6.3 shows the frequency terms relating to collaboration were used in the interviews.

Term	Frequency of Use	Percentage
Network	72	19.20%
Relationship	59	15.73%
Networking	45	12.00%
Interaction	37	9.87%
Group	28	7.47%
Networks	24	6.40%
Working with	23	6.13%
Interact	20	5.33%
Alliance	17	4.53%
Meetings	10	2.67%
Collaborative	9	2.40%
Collaboration	6	1.60%
Partners	6	1.60%
Interacting	7	1.87%
Partnership	5	1.33%
Co-operation	2	0.53%
Collaborating	1	0.27%
Do business with	1	0.27%
Interacts	1	0.27%
Participation	1	0.27%
Working together	1	0.27%
Total	375	100.00%

Table 6.3 Frequency of Use of Terms Indicating Collaboration
Source: Author

Collaboration emerged as a particularly strong theme throughout the interviews. It ranged from straightforward business generation facilitated by the cluster "… *our main aim is to generate business from it"* (Interviewee I) to more

developmental practices “[they] *asked me to develop a machine that would take the silt from the sea bed and pump it into land bags”* (Interviewee H) and industry-academia links “*… so you’ll have businesses who are really good at stuff but… they could do with some support from academics from the universities”* (Interviewee J).

“I think one of the strengths of [the cluster organisation] is its collaborative direction. There's, I think something that has always struck me compared to other similar or other local networking events is [that the cluster organisation] is a very collaborative field, so you can walk in and instead of people asking you what you can do for them they’re quite often providing you with opportunities or putting you in touch with people that you might not know. Because it struck them that that would be a useful contact” (Interviewee K).

Sitting alongside these aspects are the more collaborative projects included in the cluster governance model proposed by Berthinier-Poncet (2014). Marine renewable energy projects were highlighted by a number of interviewees as being particularly driven by the cluster organisation.

A further example of a collaborative project was provided by Interviewee A “I was involved in a European project… and there was networking across Europe. It was a sustainability project [and we were] involved when looking at transport links and dredging…”

There was a perception that the cluster has got “… a very collaborative feel and so… members look out for each other and something that I’ve always said which, for instance, in the offshore wind sector, where the UK seems to struggle to get… big contracts for building or… for bases here to produce turbines and the like, it’s

because the competition from Northern Europe is so fierce and they always seem to win the awards for… the sites or for the ports. It strikes me that in Northern Europe they have a much more collaborative approach to tendering so, for instance, a port in Northern Europe will go to the likes of Siemens or somebody and say, “We can provide the port, we can provide the land, we can provide the tugs, we can provide the professional services, we can provide everything you need, you just need to speak to us and we’ll sort it for you,” whereas in the UK the tendering exercises seems to be much more sort of self-serving so the port might say, “Well, we can come and do this,” and Siemens will say, “Well what about everything else?” They say, “”Well you’d have to speak to them separately,” and everyone tendered separately and you can understand why these big, you know, engineering organisations want a one stop shop and I think [that the cluster organisation] is a good example of an organisation that’s trying to stimulate or generate that one stop shop service for people who might be looking to the area to come and invest” (Interviewee K). The role of the cluster organisation in creating that collaborative environment is particularly important and thus reinforces its importance in the cluster governance model. It is of little surprise that collaboration featured prominently; there is significant discussion across the maritime literature (McKinley, 2012; Rivera, Sheffi and Knoppen, 2016; Hansen et al., 2018; Haezendonck and Langenus, 2019; Wang et al., 2020; Tran et al., 2020).

Findings from the interviews demonstrate further support for collaboration as discussed by Lawrence and Suddaby (2006;), Berthinier-Poncet (2014;) and Wise, Wilson and Smith (2016) and presented as Figure 6.4.

6.11.2.5. Emerging Themes

Cluster identity was examined in chapter three and whilst boundaries – or geographical proximity – are related to the shared identity of the cluster, and of the membership element of the political aspect, there is an argument to suggest that this element could be included as a separate element of the normative aspect of the cluster governance model. Geographical proximity is important as the interviews suggest that geographical proximate members make a greater contribution to the shared vision and goals of the cluster than do geographically disparate members; in terms of cluster governance in the context of policy-driven clusters, the cluster organisation has to manage such cluster limits.

A number of interviewees established a link between geographical proximity and the shared vision and identity: "*the* [maritime] *industry is the region"* (Interviewee J); "*… it's a very useful organisation to be able to network and meet people within the sector, locally"* (Interviewee K); "*… it's easier to sell the city when we are all doing it together"* (Interviewee I); "*So by being there, by just giving something back to the city, other people want to give to the same project"* (Interviewee H). Interviewee K also highlighted the role of the cluster organisation in developing knowledge and understanding of issues in the local sector.

There appeared to be a distinction amongst the interviewees between those who actively engaged with other cluster members as a result of cluster organisation activities, and those who did not. Those who did not appear to be actively involved on a regular basis also spoke of geographical proximity as being less important to them. A member of one regional cluster argued that "*it's not local is it because it's* [location redacted]*. You know* [here] *it's different because* [the cluster organisation] *also doesn't restrict itself to* [location redacted]*. It says… the hub* [is

here] *but actually there's maritime business services activity all over the country. And you know, so it's not really right to see it as some local thing. It's not that parochial*" (Interviewee E). This was supported by Interviewee D who viewed the activity of the cluster as being "*… less around impact on the region, but more about impact on the sector itself".*

There is support within the literature for the inclusion of cluster boundaries as a measure of governance; Cassanego Júnior et al., (2019) discuss structures of clusters across a number of sectors, whilst both Stavroulakis et al., (2019) and Shi et al., (2020b) lend support in the maritime sector.

6.11.3. Cognitive Governance

The cognitive aspect of the cluster governance model relates to knowledge management, the creation of cluster-specific knowledge and is a "*source of innovative performance and sustainability for business"* (Berthinier-Poncet, 2014 p. 10).

6.11.3.1. Mimicry

Mimicry in the cluster context relates to organisations adopting similar structures and behaviours to facilitate innovation and knowledge sharing (DiMaggio and Powell, 1983; Lawrence and Suddaby, 2006; Wise, Wilson and Smith, 2016).

Some antecedents of knowledge creation capacity discussed by Arikan (2009) were present: "*… it's about a collective focus and understanding what the collective focus of the region should be"* (Interviewee G); "… *instead of people asking you what you can do for them they're quite often providing you with opportunities or putting you in touch with people that you might not know"* (Interviewee K) but isomorphism itself received little attention during the

interviews; this may be explained by a lack of awareness of the term, or that mimicry can occur through tacit knowledge exchange and so may be unrecognised (Brookes and Altinay, 2017).

6.11.3.2. Enhancing Absorptive Capacities

The general level of education and workforce skills development forms a key part in the enhancement of regional competitiveness. There is a clear alignment between the skills development needs of the region and through the governance of the cluster the ability of clustered firms to benefit (Berthinier-Poncet, 2014; Wise, Wilson and Smith, 2016).

The role of the cluster in identifying and facilitating training was evident across a number of the interviewees: "*they can fund niche training"* (Interviewee E); they open up opportunities "*for learning events* [and support] *training and development generally"* (Interviewee B); *"it makes them aware that there are training providers in the city"* (Interviewee H).

The relationship and interaction between a cluster organisation and training providers was highlighted as being good practice, not only for the region, but for individuals undertaking such training: "*what I found really refreshing is how the organisation is linked to the college where they're not training people in qualifications that are going to be useless"* (Interviewee I). This is focused training has arisen given that relationship, whereby the cluster organisation interacting with local businesses to find out their needs, rather than training people "*in x, when all of the local businesses are wanting y"* (Interviewee I).

These findings are consistent with the *a priori* themes presented as Figure 6.4

6.11.3.3. Knowledge Management

There are three broad areas that make up the knowledge management aspect of cluster governance: the identification, acquisition and use of knowledge (Bocquet and Mothe, 2010; Berthinier-Poncet, 2014) It has been argued that a common knowledge base should be established in order for the external knowledge identification and acquisition processes can take place (Bocquet and Mothe, 2010). Evidence of the creation of a common knowledge base and the acquisition of external knowledge was present among the interviewees: "[the cluster] *creates a maritime centre of excellence"* (Interviewee G); the knowledge transfer process is based on the creation and maintenance of an environment where people are able to share (Interviewee J).

With an environment conducive to the transfer of knowledge, evidence was also present of the approaches taken to sharing knowledge, both internally: "*there are workshops that are run from time to time by members in particular areas that members of the team have been on… which help broaden… the team's… expertise"* (Interviewee K); and from external sources: "[there are opportunities] *to meet people from outside of the local area who are in the sector who… come and give talks to the group"* (Interviewee K); but there is an expectation that in order to benefit, organisations must participate "*if you just sit here and expect it all to come to you it's just not going to happen"* (Interviewee F).

This aspect of the cluster governance model was well discussed during the interviews and supports inclusion of this into the model of governance shown as Figure 6.4 that was developed from Lawrence and Suddaby (2006; Berthinier-Poncet (2014) and Wise, Wilson and Smith (2016)

6.11.3.4. Emerging Themes

A theme that fits within the cognitive aspect of the cluster governance model is one of internal support. This is perhaps an extension of the knowledge management and of absorptive capacities themes but appears to sit well as a theme in its own right. Internal support relates to the processes, facilitated by the cluster, that enable clustered firms to support each other, in areas such as technical and commercial co-operation, knowledge sharing (as discussed in 7.4.3.3) and engagement across the Triple Helix model.

6.11.4. Cluster Governance Summary

The interview analysis demonstrates support for the cluster governance model proposed by Berthinier-Poncet (2014); the analysis also shows areas to be included as additional themes within the model. Key findings from the interviews are summarised by theme as Table 6.4.

Theme	Sub-theme	Key Findings
Political	Branding	• External representation and lobbying • Regional industry representation • Provides credibility for the sector and region
	External Support	• Identifies external sources of funding • Facilitates funding applications • Identification of external training • Communicates information from outside the cluster
	Membership	• Not critical in the relationship with the cluster organisation • Focus must be on members from the maritime industry • Related firms can be members where they are complementary • Focus on organisation with members, rather than a membership organisation
	Conflict Resolution	• Did not emerge as important to members
	Emerging Themes	• None
Normative	Identity & Strategy	• Shared identity provides shared opportunities • Shared identity important for regional maritime development • Collective focus enables collective problems to be solved • Clear cluster strategy drives belief in the cluster
	Communities	• Represented as sub-groups, and cluster association as a whole • Sub-group focus on collaborative focus on shared issues and opportunities • Facilitator of trust and shared vision

Theme	Sub-theme	Key Findings
	Network Linkages	• Important for the development of trust and shared vision • Enables participation and collaboration • Facilitates diffusion of knowledge
	Collaboration	• Contributes to innovation • Brings together different parts of industry will complementary skills • Link to education/research institutes • Emphasis on sharing
	Emerging Themes	• Geographic proximity important to cluster identity and development; also to shared vision and identity
Cognitive	Mimicry	• Not well-developed in the interviews • Enabled opportunities to be realised • Contributes to shared language, codes and meanings
	Enhancing Absorptive Capacity	• Cluster provides training opportunities • Provide funding • Focus on regional skills needs • Enables knowledge creation and diffusion
	Knowledge Management	• Focus on creation and diffusion of knowledge and expertise • Knowledge sharing by member firms and from external organisations • Member participation is critical
	Emerging Themes	• Internal support; cluster organisation helps members to help each other.

Table 6.4 Summary of Key Cluster Governance Findings by Theme
Source: Author, based on Interview Analysis

These themes are internal support and cluster boundaries. As a result, Figure 6.5 shows the revised cluster governance themes model (with additional themes shown in italics) model.

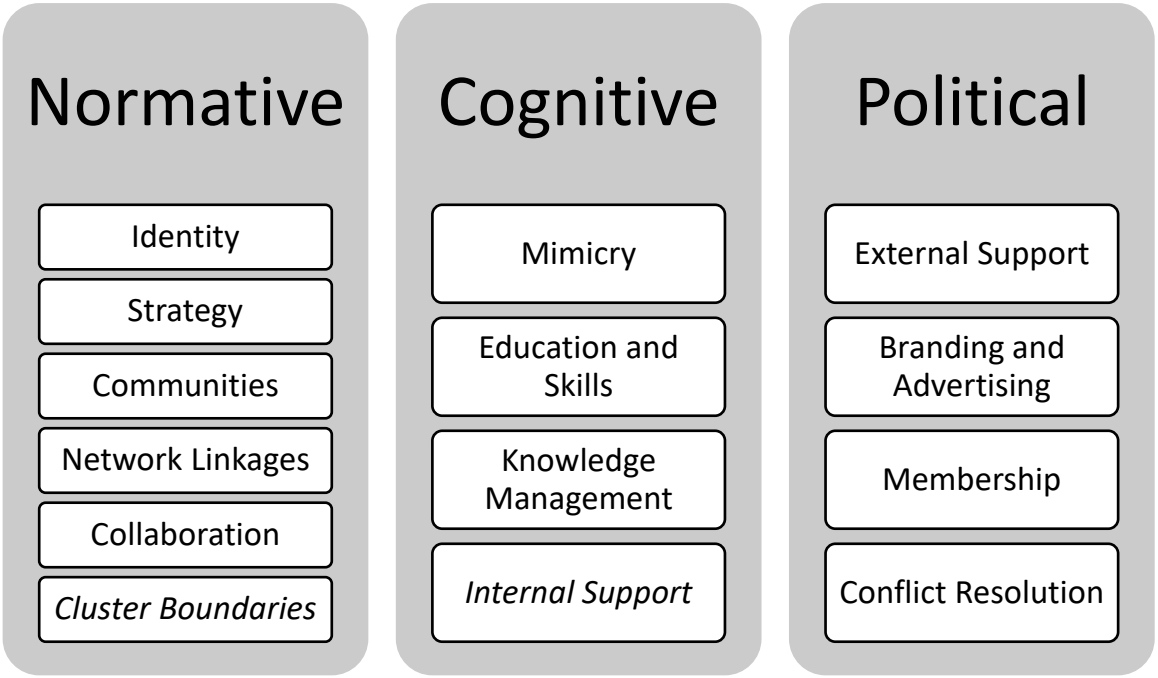

Figure 6.5 Revised Cluster Governance Themes
Source: Author, based on Berthinier-Poncet (2014); Ganescu & Gangone (2012); Lawrence & Suddaby (2006) and Interview Analysis

With these confirmed, the chapter moves on to examine the findings from the sustainable development part of the interviews.

6.12. Sustainable Development

The second major theme examined during the interviews was the perception of sustainable development and its relationship with the cluster.

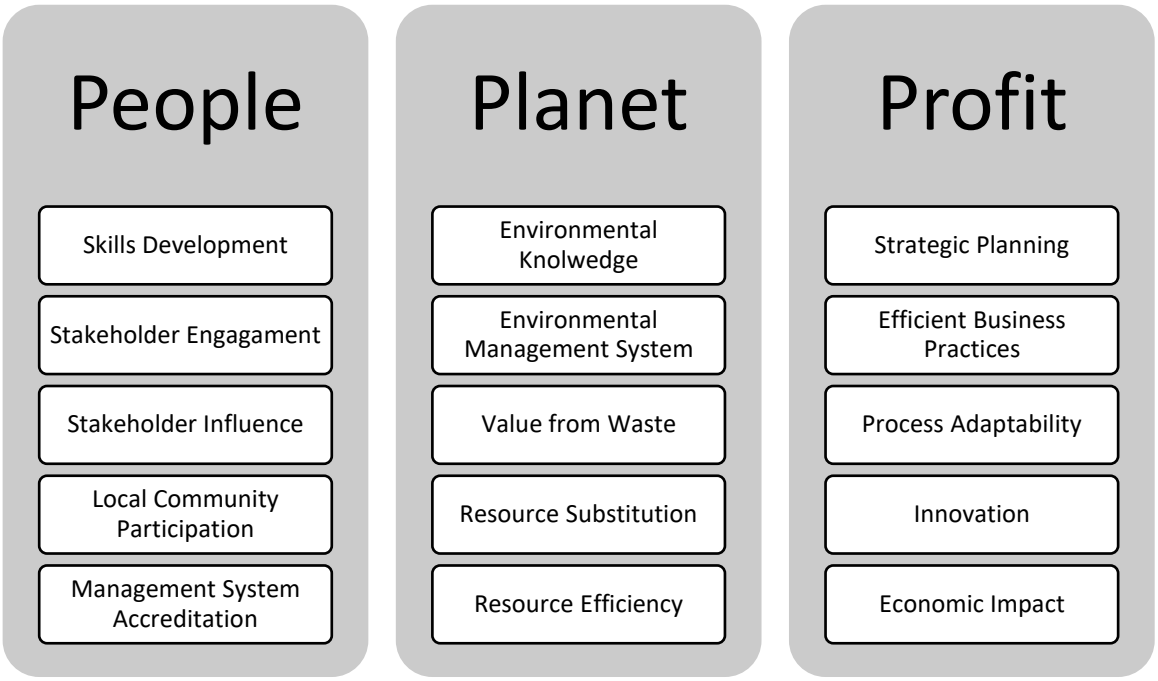

Figure 6.6 *a priori* Sustainable Development Themes
Source: Author, based on Bocken et al. (2014), and Kuznetsov et al. (2015)

6.12.1. Perception of Sustainable Development

Each interviewee was asked to give their perception of sustainable development; responses are summarised in Table 6.5Table 6.5. Many of the responses focused on the long-term survival and growth of the organisation. From a regional perspective, Interviewee G emphasised sustainability as being "…*development that has a long-term focus and benefit for the region…"*

Some highlighted the importance of environmental issues: "…it's done with due regard to the environment…" (Interviewee A); and that it "…doesn't destroy the resources or environment that it requires to sustain itself…" (Interviewee E). Interviewee E emphasised the environmental aspect of sustainability further: "It is an environmental terminology" and viewed the application of sustainable development in the maritime business services sector with some reservation: "I don't think sustainable development's a useful term in this context…. you know, I mean, you know these are service businesses… they don't destroy resources

that they need. I mean it just doesn't work like that" (Interviewee E). Table 6.5 shows a summary of all participants' perceptions of sustainable development.

Interviewee	Perception of Sustainable development
A	Ports that aren't sustainable wither and die. It's the ability to exist within your means of… That an organisation will be able to, you know if I steal a phrase, "Wash its face." So the income and expenditure can be matched with a small surplus. It means that it's done with due regard to the environment and that we are operating in a conscientious way within our means and we do set some goals and we look to perhaps generate surplus that we can invest for the long term on infrastructure and the maintenance of that port for the benefit of our stakeholders who, some of whom we haven't identified yet…
B	Sustainability in a business sense, I think it means wellbeing of staff, the environment and how our products can benefit the environment locally and internationally
C	You have to have a sustainable business for the, you know for the long-term future of the dry dock
D	Sustainable development… means… continuing to meet the needs of seafarers as they evolve and change over time.
E	Well, it means growth or development which doesn't destroy the resources or environment that it requires to sustain itself. I don't think Sustainable development's a useful term in this context. I mean what the f*** does it mean? You know, I mean, you know these are service businesses they don't have… They don't destroy resources that they need. I mean it just doesn't work like that. It is an environmental terminology.
F	It probably means different things to different people. For me it means about the sustainability… as a business. Is what we're doing now sustainable in the future? Is it going to benefit us in the future and can we keep it going or growing?

G	Well to me sustainable development is development that has a long-term focus and benefit for a region; that's it's not a smash and grab job, a quick buck, a massive construction project that then finishes and leaves tumbleweed all over the place. It's about the longevity of a region and it also has obviously in the world we live in today an environmental aspect as well so responsible development as well as the social aspects and the environmental aspects hand in hand for a long-term benefit is my understanding of sustainable development.
H	Sustainability to me is very much around trust. Sustainability for me is someone that doesn't just want one job doing and you never see them again, that doesn't work for me, that. Sustainability to me is all around trust, relationship and a working partnership with people.
I	As [an organisation] if we're not happy with turning up every two weeks and being in involved in it then we cease to exist,
J	…when you talk about sustainability for the industry and the region, I'm going to take it that you're asking me where's the growth sector and how are we supporting that growth, I think. The big challenge for the maritime sector is skills, number one, number two, the other challenges R&D innovation, and that's commercialised them.
K	…ultimately good client relationships, happy clients.

Table 6.5 Participant's Perception of Sustainability
Source: Author, based on Interview Analysis

The social dimension of sustainable development was explicit amongst some: '…*it means wellbeing of staff…"* (Interviewee B); "…*responsible development as well as the social aspects…"* (Interviewee G); with particular emphasis on skills for Interviewee J: "…*the big challenge for the maritime sector is skills…"*

Two more concepts emerged during the analysis: firstly, that sustainable development could incorporate aspects of innovation (Interviewee J); and issues of trust and relationships (Interviewees H & K).

The views expressed during the interview stage support the stated three pillars of sustainable development – people, planet, and profit – and highlighted some interesting themes around innovation and trust. These latter themes link to the underpinning cluster theories around enhancing collaboration.

The interviews continued with a discussion of the pillars of sustainable development that form part of the Triple Bottom Line proposed by Elkington (1997). For the purposes of this research, these pillars were referred to as the people, planet, and profit dimensions of sustainable development.

6.12.2. People

Social sustainability can be viewed as the impact organisations have on their employees, workers throughout their supply and value chains, customers, stakeholders and communities in which they operate (United Nations, 2020). Amongst the interviewees, the people aspect of sustainable development was seen as important: "you need the right people. You need the right skills. You need the right experience. You need to keep the experience which exists in the UK going" (Interviewee E). As a result, education and skills development formed a significant part of the perceived people benefits of the cluster, with the role of the

cluster being to identify training opportunities, provide education and skills development, and promote employment prospects.

A number of the interviewees spoke directly of the training benefits on offer to members: “[the cluster] opens up opportunity for learning events, supporting training and development generally” (Interviewee B); “I’ve got two current employees… being offered apprenticeships to develop their positions within the company (Interviewee C).

The wider training role of the cluster was discussed: “the training and skills issues are self-evident because of the way they’ve built their own training school… and there’s a real engagement between skills gaps and employer led training” (Interviewee F); with the ability to retain knowledge in the region being important “because it creates a maritime centre of excellence and if a sustainable maritime centre of excellence is established then the benefits for the whole region are enormous” (Interviewee G).

The role of the cluster organisation in providing access for employment opportunities was discussed: “*we had a member who needed to recruit a lot of engineers* [so] *we put them in touch with the* [cluster organisation] *who have got themselves a new member who’s already getting a return out of the membership*” (Interviewee I); “*one of things we are trying to do through our networks with the sector is provide career pathways for the young people in the sector. So in terms of skills development and long-term career prospects, we see the networks providing that linkage for our 14,000 young people”* (Interviewee D), a view supported with another adding *“I’ve worked with 2,500 young people over the last*

12 years since I started the project and I see them all going into jobs and into education" (Interviewee H).

Whilst the people dimension dominated, there was some discussion about maintaining customer their base and staying relevant to customers need (Interviewee A); being able to support the community in which they operate (Interviewee C); and supporting local educational providers (Interviewee K).

Findings from the interviews supported the model shown as Figure 6.6 based on Bocken et al. (2014), and Kuznetsov et al. (2015). These aspects fit within the range of social sustainability issues highlighted by McKenzie (2004), including employment (Sommers and Wenzl, 2009; Laaksonen and Makinen, 2012; Portsmuth et al., 2012; Mefford et al., 2013), Corporate Social Responsibility (Battaglia et al., 2010), and stakeholder engagement and management (Timur and Getz, 2008; de Langen, 2006; Merli, Preziosi and Massa, 2014).

6.12.3. Planet

Of the three pillars discussed, the planet pillar was the least developed. This is perhaps in part due to the types of businesses from which the interviewees were drawn, where environmental issues are less pertinent.

Knowledge played an important role in one interviewee's experience, where the cluster was involved in the "sustainable development of the Arctic; putting regulations in place that will make it safer for seafarers, protect the indigenous community and help prevent pollution" (Interviewee G). The cluster driving innovation with an environmental aspect was discussed, where the cluster has a sub-group dedicated to renewable energy from marine sources (Interviewees A & B).

Whilst the interviews did not expand further on themes derived from Bocken et al. (2014), and Kuznetsov et al. (2015), findings did not contradict them either. As a result, the themes making up the planet pillar in Figure 6.6 will be taken forward to the quantitative phase and be tested there.

6.12.4. Profit

Issues around the profitability and long-term economic viability of organisations tended to dominate the initial part of discussions around sustainable development; "*any business that is not profitable is not sustainable"* (Interviewee C) and that any efforts have "*to be economic at the end of the day* (Interviewee F).

The role of the cluster organisation was discussed as a means of achieving economic growth through a number of means, including: the strategic orientation of the cluster "*clearly the goal is to create new business"* (Interviewee E); networking "*it has been identified on our business plan and on our marketing plan to leverage that membership"* (Interviewee C); and the use of knowledge to drive economic growth "*clearly being a member of* [the cluster organisation] *has to have an impact on your company because without being a member you're not in a position to know as much as you can by being a member"* (Interviewee G).

The financial viability of the cluster organisations was discussed: membership was seen as important "*you need membership to fund things like these cluster organisations"* (Interviewee F), with an aim of being self-supporting, but with the ability to be selective over membership (Interviewee J).

The analysis of the interviews pertaining to the profit pillar aligned with the model shown as Figure 6.6 and the related literature. There is widespread discussion

within the cluster literature of the role clusters can play in economic development, increased firm performance, competitiveness, and innovation (Nooteboom, 1999; Porter, 2001; Carbonara, 2004; Rialland, 2009; Wise, Wilson and Smith, 2017; van Aswegen and Retief, 2020). No further themes emerged during this preliminary qualitative phase.

6.12.5. Sustainable Development Summary

This section examined the findings of the sustainable development part of the interviews. Starting with a review of perceptions it demonstrated the importance of sustaining and developing the business as a central tenet of sustainable development. Other related activities were generally seen as secondary to, or supportive of, staying in business. The three core aspects of sustainable development were investigated in turn; key findings from the interviews are summarised by theme in Table 6.6.

Theme	Sub-theme	Key Findings
People	Skills Development	• Skills are critical • Staff development and engagement with educational institutions • Long-term issue
	Stakeholder Engagement	• Engagement with wider region • Provide benefit to stakeholders • Stakeholder involvement in development issues
	Stakeholder Influence	• Increasing awareness of industry issues • Promoting the maritime industry • Providing benefit
	Local Community Participation	• Contributing to region • Engagement with educational institutions • Engaging with local community
	Management System Accreditation	• Open dialogue through relationships • Takes into account different factors • Long-term view of business development
Planet	Environmental Knowledge	• Operations take environmental considerations into account • Exercising diligence in decision-making • Collaboration to develop knowledge
	Environmental Management System	• Operating in a conscientious way • Informing decision-making • Formal recognition not significantly important
	Value from Waste	• New ways to use waste by-products • Collaboration to solve common problems • Proximity important to achieve this
	Resource Substitution	• Developing renewable energy sources through collaboration • Knowledge creation and diffusion to meet challenges • Lower recognition in business service firms
	Resource Efficiency	• Sharing assets • Integration of systems • Lower recognition in business service firms

Theme	Sub-theme	Key Findings
Profit	Strategic Planning	• Cluster membership in business plan • Key part of sustainable development • Meeting future needs
	Efficient Business Practices	• Sharing best practice • Closer integration • Contributes to new ways of working
	Process Adaptability	• Ability to meet changing regulations
	Innovation	• Significant challenge to the maritime industry • Link to academic and R&D institutions • Environmental focus
	Economic Impact	• Remaining in business • Contribution to region through wages, taxation and indirect spend • Financial management critical to sustainability

Table 6.6 Summary of Key Sustainable Development Findings by Theme
Source: Author, based on Interview Analysis

Figure 6.7 shows the confirmed conceptualisation of sustainable development.

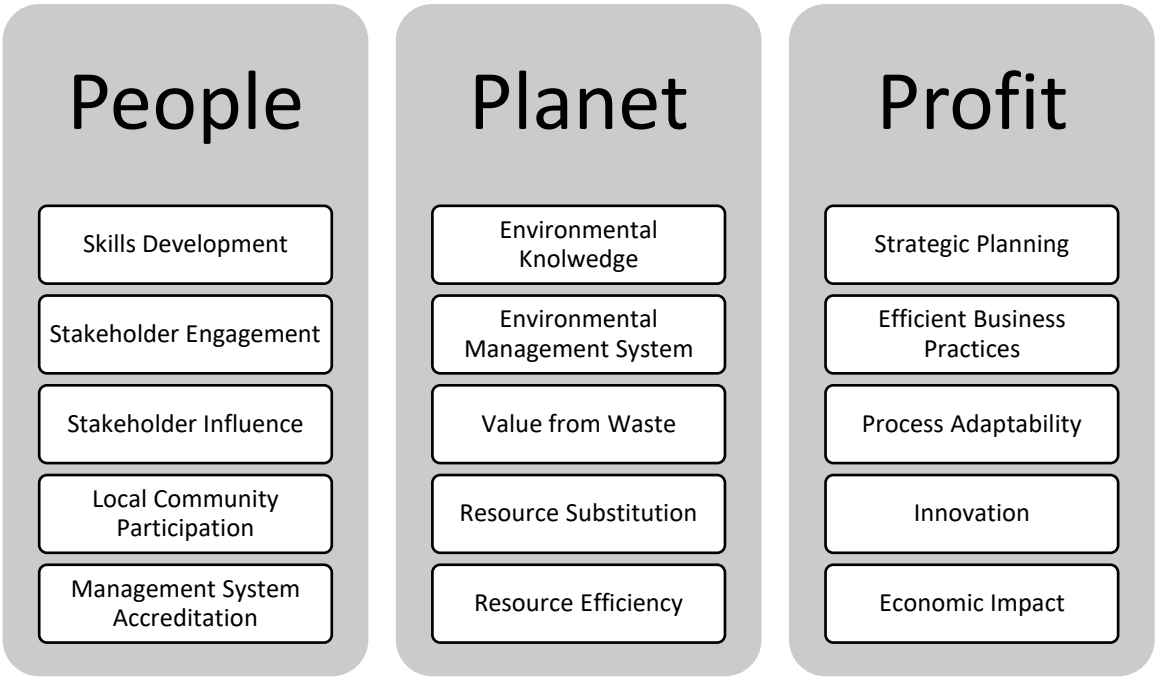

Figure 6.7 Confirmed Sustainable Development Themes
Source: Author, based on data analysis, and Bocken et al. (2014), and Kuznetsov et al. (2015)

The findings enabled the confirmation of the themes to be taken forward to the quantitative phase; this confirmation resulted in no changes to the theoretical model shown earlier.

6.13. Social Capital

The examination of social capital during the interviews closely matched the social capital and social capital literature. Core aspects including commitment, collaboration, engagement, network ties, shared vision and trust were discussed.

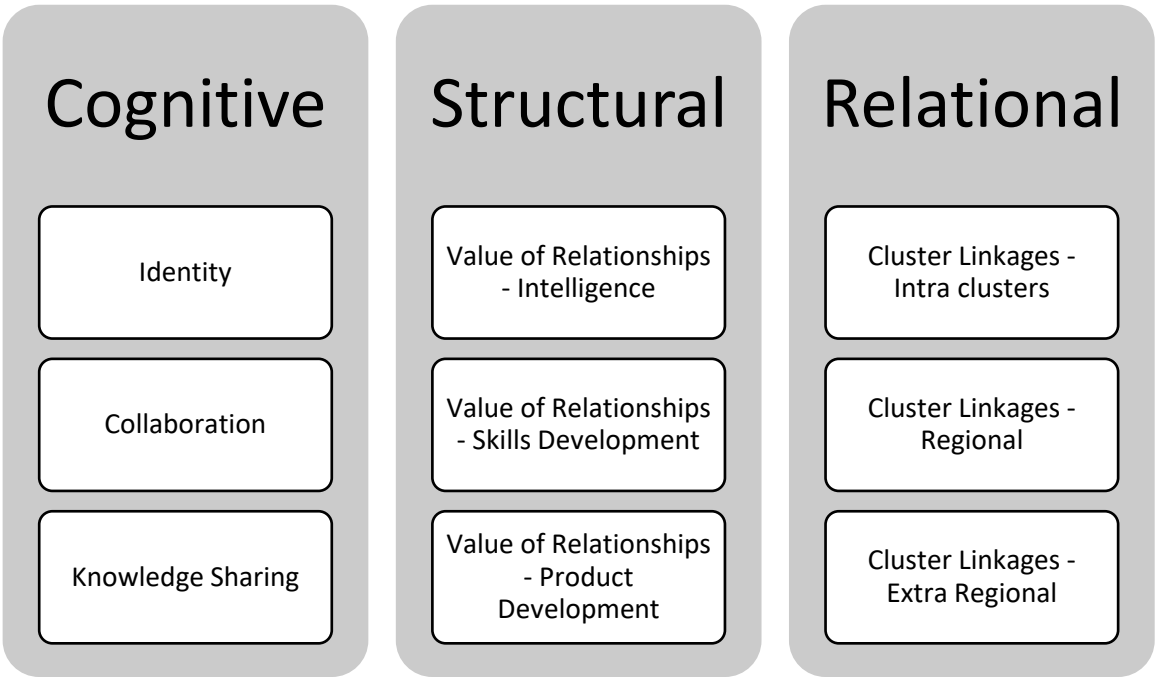

Figure 6.8 *a priori* Social Capital Themes
Source: Author, based on Smith and Brown (2009), Derbyshire (2010) and Hunter (2013)

Figure 6.8 shows the *a priori* themes of social capital drawn from the literature.

6.13.1. Cognitive Social Capital

The cognitive aspect of social capital relates to factors such as shared meaning, language, codes, artefacts, representations and interpretations that facilitate the sharing of knowledge (Hunter, 2013). This can be focused into three areas within the cluster context: development and sharing of identity; collaboration; and the sharing of knowledge. All interviewees talked at length about collaboration and identity. Interviewee B stated that the cluster "*opens up opportunity of collaboration"*; a view shared by Interviewee A "*a bit of a model for co-operation"*; Interviewee G added that the cluster provides "*legitimacy to interact with all the other members";* finally, Interviewee K felt that the cluster was "*very collaborative, it's got a very collaborative feel... [with]…members looking out for each other."*

These findings are aligned with the academic literature (Nahapiet and Ghoshal, 1998; De Carolis and Saparito, 2006), and specifically those used in the development of the model presented as Figure 6.8.

6.13.2. Structural Social Capital

Structural social capital relates to the way in which factors affect the ability of participating actors to access networks and exchange knowledge (Nahapiet and Ghoshal, 1998). It refers to the linkages and ties across networks as a whole. The value of relationships developed by being part of the cluster is a proxy measure of the structural aspect. The literature was clear on the benefits in terms of economic development and the growth of innovation resulting in the *a priori* codes shown in Figure 6.8; these areas were supported by the interviewees.

During the interviews, it became apparent that the interviewees saw value in three other key areas: market access; regional influence; and industry reputation.

The cluster organisation was viewed by interviewee A as being a maritime ambassador, who would "*represent us in different industry sectors…they keep the politicians briefed about the importance of the sector."* Interviewee I viewed market access as being important *"they're very open to getting involved in supply chains and they understand the importance";* a view shared by interviewee D "*it's the 800 responses in a week* [for a particular role]*".*

There were no additional themes identified during interviews that related to the structural aspects of social capital, thus confirming the three themes identified from the literature (Wasserman and Faust, 1994; Nahapiet and Ghoshal, 1998).

6.13.3. Relational Social Capital

Whilst the structural dimension influences the accessibility of actors in the network, the relational dimension refers to the personal relationships made by actors within the network. The factors described earlier of trust, norms, obligations and expectation all have influence within this dimension. This manifests itself in the relationships between organisations, both within and without the cluster. The interviewees spoke of the development of long-term relationships, including aspects of trust, and the impact this had on business relationships.

The key findings from the analysis are consistent with the literature (Granovetter, 1985; Burt, 1992; Putnam, 1993; Nahapiet and Ghoshal, 1998) and the specific aspects incorporated into the social capital model (Smith and Brown, 2009; Derbyshire, 2010; Hunter, 2013); no additional themes emerged during this stage.

6.13.4. Social Capital Summary

This section examined the interviews in the context of social capital. The three dimensions of social capital were discussed in turn within the context of maritime clusters; this confirmed the *a priori* themes drawn from the literature; key findings from the interviews are shown by theme as Table 6.7

Theme	Sub-theme	Key Findings
Cognitive	Identity	• Identity important to shared vision and collective action • Contributes to shared meanings • Being part of something bigger
	Collaboration	• Develops trust • Collective focus • Shared language and understanding contribute to collaboration
	Knowledge Sharing	• Dissemination of knowledge, formally and informally • Providing the right environment • Trust and shared vision is important
Structural	Value of Relationships – Intelligence	• Pooling of expertise • Links to decision-makers • Link to specialist intelligence
	Value of Relationships – Skills Development	• Investment in people • Skills development fosters innovation • Enhances regional economic contribution
	Value of Relationships – Product Development	• Collaboration • Diversity enables development • Provides benefit to SMEs
Relational	Cluster Linkages – Intra Cluster	• Provides access to likeminded people with similar interests, builds trust • Access to knowledge and skills • Sharing complementary skills for business development
	Cluster Linkages – Regional	• Spillover effects for other businesses • Regional thought leadership • Contribution to wider region
	Cluster Linkages – Extra Regional	• Links to business opportunities outside the region • Bringing in specialist knowledge and expertise • Source of funding

Table 6.7 Summary of Key Social Capital Findings by Theme
Source: Author, based on Interview Analysis

The confirmed conceptualisation of social capital is shown in Figure 6.9 and taken forward to the quantitative phase.

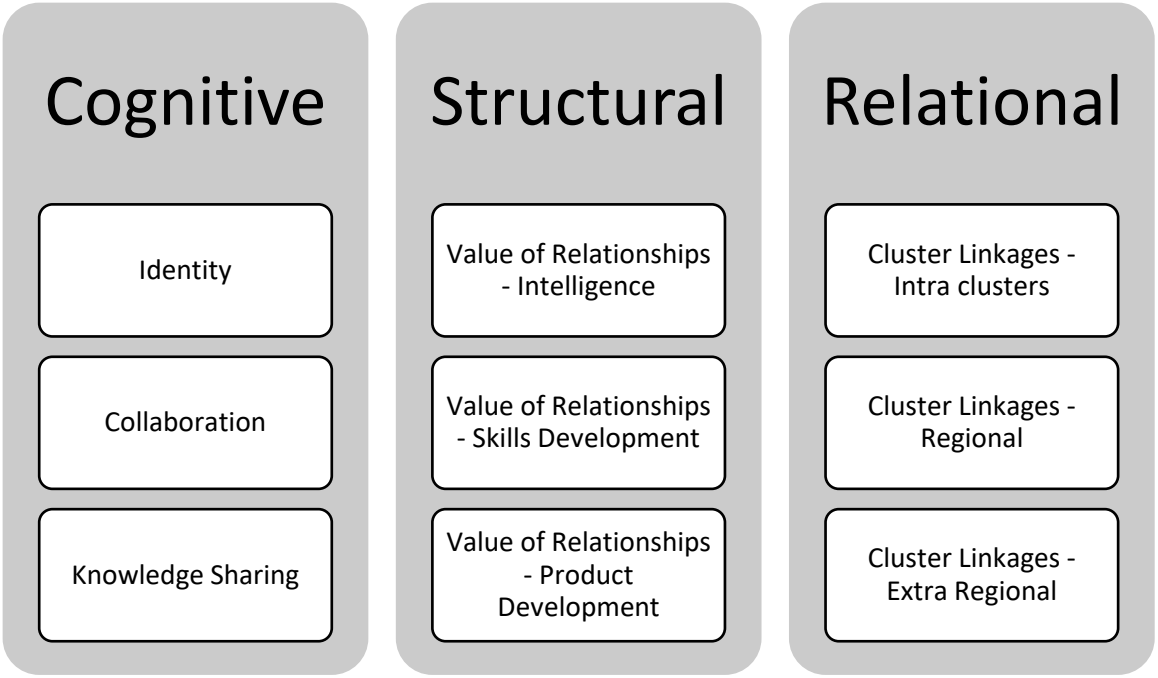

Figure 6.9 Confirmed Social Capital Themes
Source: Author, based on data analysis, and Nahapiet and Ghoshal, (1998); Smith and Brown, (2009); Derbyshire, (2010); Hunter, (2013)

Having completed the analysis of the findings and discussion of their alignment to academic literature, the chapter moves on to the refinement of the conceptual model.

6.14. Summary

The purpose of the preliminary qualitative phase was to confirm the relevance of the a *priori* themes drawn from the literature within the maritime cluster context; the phase also sought to identify emerging themes for inclusion. The interview data was analysed using the template analysis approach explained in the previous chapter and lists of appropriate themes confirmed. These themes were then mapped to the conceptual model shown in section 4.7 to inform the development of the questionnaire used in the next phase of the research.

Construct	Theme	Sub-theme
Cluster Governance	Normative	Identity
		Strategy
		Communities
		Network Linkages
		Collaboration
		Cluster Boundaries
	Cognitive	Mimicry
		Education & Skills
		Knowledge Management
		Internal support
	Political	External Support
		Branding & Advertising
		Membership
		Conflict Resolution
Social Capital	Cognitive	Identity
		Collaboration
		Knowledge Sharing
	Structural	Value of Relationships: Intelligence
		Value of Relationships: Skills Development
		Value of Relationships: Product Development
	Relational	Cluster Linkages: Intra-cluster
		Cluster Linkages: Regional
		Cluster Linkages: Extra-regional
Sustainable Development	People	Skills Development
		Stakeholder Engagement
		Stakeholder Influence
		Local Community Participation
		Management System Accreditation
	Planet	Environmental Knowledge
		Environmental Management System
		Value from Waste
		Resource Substitution
		Resource Efficiency
	Profit	Strategic Planning
		Efficient Business Practices
		Process Adaptability
		Innovation
		Economic Impact

Table 6.8 Summary of Themes for Quantitative Phase
Source: Author

Drawing on interviews from three maritime cluster associations, the model, based on themes of sustainable development, cluster governance and social capital was largely confirmed with some aspects of the model redefined as a result; this is shown as Table 6.8. The findings were consistent across the three clusters used in this phase of the research.

The following chapter introduces the quantitative phase of the research, examines the methods used, and explains the development of the questionnaire.

Chapter 7. Quantitative Phase

7.1. Introduction

This chapter draws on the methodological framework outlined in Chapter 5 to examine the quantitative phase of the research. The chapter focuses initially on issues relating to the survey research strategy (questionnaires) employed in the study, before explaining the development of the research instrument itself. The sections and questions comprising the questionnaire were developed jointly from the literature and preliminary qualitative phase that was described in the previous two chapters.

7.2. Questionnaires

Survey research is often undertaken using questionnaires (normally postal or web-based) or interviews (normally face-to-face or telephone) (Collis and Hussey, 2009; Bryman and Bell, 2011). This research used a mix of web-based and postal questionnaires. This was because not all of the cluster members had publicly available email addresses.

Given the range of data collection methods available to the researcher it is important to understand the inherent characteristics of each method so as to overcome associated difficulties, such as common method bias (McDonald and Adam, 2003). The questionnaire used in this research was distributed by post and email linking to a web-based version, the latter using the Qualtrics survey software (Qualtrics, 2017b), following a similar approach to those used in previous cluster-related studies (Liao, Fei and Chen, 2007; Lai et al., 2014; Dahl and Pedersen, 2004). Both methods were used concurrently to ensure distribution to all cluster members.

It is recognised that the use of questionnaires poses some limitations in the collection of data, including an inability to clarify questions and/or responses; and responses are limited to the options provided (Bryman and Bell, 2011). This can lead to criticism that survey research may not be suitable in explaining established social phenomena, although the use of second-generation data analysis techniques such as PLS-SEM have overcome much of the criticism (Hair et al., 2017). PLS-SEM is discussed later in the chapter in section 7.6.

7.2.1. Online Questionnaire

The online questionnaire was the dominant method of distribution. Posting large numbers of both questionnaire and response within the UK would have been costly and time-consuming, but especially so with countries such as Australia and Canada. It has been argued that a common method of delivery also reduces potential bias, although Deutskens et al., (2006) found little evidence of systematic bias between online and postal questionnaires, with both methods producing near-identical results across a range of measures, including: composite reliability; average variance extracted; number of responses; and variance-covariance matrices.

This study used the web-based approach whereby emails sent to potential respondents contained a hyperlink to the Qualtrics-based survey. This is distinct from an email survey where the recipient receives either an attached document to complete, or the questions are contained within the body of the email (Bryman and Bell, 2011). The web-based approach was preferable to the email approach as it provided a more straightforward response method and easy download of data (Bryman and Bell, 2011). The web-based survey also enables easier

distribution of reminders, often an automated process within the software package (Qualtrics, 2017a).

A further email was sent after one week, then four weeks containing similar information; an explanation of the significance of their input to the research was included to help inform and improve the response rate (Tenforde, Sainani and Fredericson, 2010).

7.2.2. Postal Questionnaire

Postal copies of the questionnaire were distributed at the same time as the web-based questionnaire. These were sent to cluster members for whom there were no email addresses available. Although response rates for postal questionnaires tends to be higher than web-based methods (Fan and Yan, 2010; McGuirk and O'Neill, 2016), it is argued that this can improve representativeness (Yun and Trumbo, 2000) without introducing bias (Deutskens, de Ruyter and Wetzels, 2006).

A research facilitation grant awarded by the University of Plymouth Faculty of Business covered the cost of the postal questionnaires. A booklet design was used to give a professional appearance and included a cover letter that was printed on University-headed paper, explaining the purpose and significance of the questionnaire, together with a statement of confidentiality; an example is shown as Appendix F: Introductory Letter for the Questionnaire

The questionnaire was sent to the named person containing a postage-paid envelope in the package. Each questionnaire had a unique serial number enabling a follow-up letter to be sent to non-respondents; this occurred one month

after the initial questionnaire was sent to allow time in the postal system and for completion.

7.3. Questionnaire Design

There are a number of issues that can act to undermine the effectiveness of a questionnaire as a research instrument; low response rate, high number of non-valid responses and a lack of interest from potential respondents (Hunter, 2013). Factors that have been found to affect such issues include the length of the questionnaire, delivery method, content, appearance, incentives and communication between researcher and respondent contained within the questionnaire (Edw*ards* et al., 2002). In order to overcome these potential difficulties, a number of factors were considered throughout the design of the questionnaire in order to maximise the response rate and minimise non-valid responses. The following sections examine such issues and the mitigating measures.

7.3.1. The Use of Likert Scales

Likert scales were used in the questionnaire as they enable the respondent to indicate how strongly they agree or disagree with a statement along a rating scale (Saunders, Lewis and Thornhill, 2012). There is little consensus on the number of points that should be included on the scale; typically four, five, seven or nine points (Garland, 1991; Preston and Colman, 2000; Wakita, Ueshima and Noguchi, 2012; Saunders, Lewis and Thornhill, 2012). There are a number of practical issues surrounding the number of points on the scale that are used; ease of use, speed of completion and the ability to sufficiently express feelings on the subject. Scales with five, seven or ten points have been found to be the easiest to complete, with those having two, three or four points being the quickest.

Scales with more than 5 points only have a minimal increase in reliability. Preston & Colman (2000) argues that scales with four or fewer points were least reliable, with validity lowest in relation to scales with four or fewer points (Preston and Colman, 2000). This is in contrast to Matell and Jacoby (1971) and Dawes (2008) who suggest that there is little difference between five, seven or ten-point scale.

There remains a debate across the literature relating to the use of mid-points on the scale (Nadler, Weston and Voyles, 2015; Chyung et al., 2017). Some argue that a scale with an even number of points removes the mid-point and thus forces the respondent to make a judgement on the statement, rather than relying on terms such as ‘not sure’ or ‘neither agree nor disagree’. It is further argued that using a mid-point in the scale can increase uncertainty in the responses, and may introduce bias into the answers, potentially forcing the respondent into a response to which they do not agree. (Garland, 1991; Tsang, 2012). The wording of the mid-point can also make a significant difference. Nadler et al's., (2015) study found that ‘neither’ was selected more frequently than ‘no opinion’ yet reflect different attitudes.

Having considered the number of points to use, and whether or not to include a mid-point, the decision was made to opt for a five-point scale in Likert style ranking questions, to be consistent with an impact rating scale of 1-5 in the sustainable development scale, with a mid-point response available. The mid-point offered an option for the respondent to be neither positive nor negative (but not to offer ‘no opinion’). There remained the potential for social acceptability bias, but the use of the mid-point appears consistent with other business and management research. A five-point scale was deemed to provide a reliable, consistent and easy-to-complete option (Preston and Colman, 2000).

7.3.2. Bias

Bias is of concern to the researcher as it can provide misleading results (Maylor, Blackmon and Huemann, 2017). There are different types of bias, including non-response, acquiescence, and method bias. This section examines acquiescence bias and the steps taken in the development of the questionnaire in this research to minimise the effects. Section 8.4.1 and 8.4.2 examines non-response and method bias, and applies the statistical measures used to test for these in the returned questionnaires.

Acquiescence bias is a common concern in survey research, especially when using agree-disagree (AD) scales, as some respondents choose the ‘agree’ option disproportionately more often than the ‘disagree’ option (Kuru and Pasek, 2016). Acquiescence bias is an individual-level trait, with three theories suggesting possible causes: evidence suggests that people want to be agreeable, and be agreed with; that people may defer to the perceived authority of the researcher; or want to complete the survey quickly, with minimal effort (Kuru and Pasek, 2016).

Strategies that can be employed to mitigate the effect of acquiescence bias include the use of balanced scales, although Schriesheim and Hill (1981) argue against extensive use of negatively worded statements suggesting that they can impair response accuracy, and by replacing AD scales with ‘item-specific’ (IS) questions (Saris et al., 2010). IS questions seek response to the extent of behaviour related to the question (Kuru and Pasek, 2016). Some negatively worded statements, known as reverse items, were used in the three main sections of the questionnaire, with the sustainable development section developed with the principles of IS questions in mind.

7.3.3. The Questionnaire Structure

In order to address the objectives of the research, the questionnaire comprises four sections with each section containing clear emphasis on the purpose of the section together with instructions on how to complete the section. Figure 7.1 shows the overall structure of the questionnaire; this leads to the next four sections examining each of the aspects in greater detail.

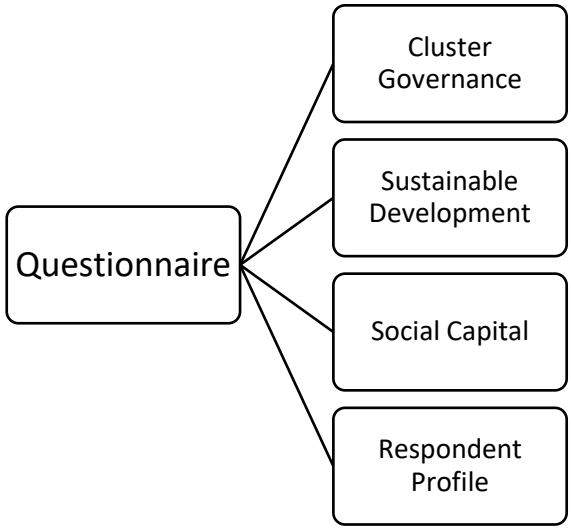

Figure 7.1 Diagram Showing the Layout of the Questionnaire
Source: Author

The first section focused on perceptions of cluster governance by the member firms and enabled the researcher to measure the three aspects, normative, cognitive and political. All of the questions used the five-point Likert scale and are shown in section 7.3.4. Part B asked the respondents to rate the impact of the cluster organisation on their sustainable development activities. Respondents had to select 1-5 on a Likert-type scale to judge impact. The third part examined the cognitive, structural and relational aspects of social capital using five-point Likert scale responses. The final part gathered data about the respondent's organisation using closed-ended questions and intended to provide the

characteristics of the final sample. The wording of the majority of the items was such that they enabled a more factual response to the question, rather than a subjective response. This contributed to the ease of response and overall user-friendliness (Holdershaw et al., 2017).

7.3.4. Part A – Cluster Governance

This part had questions based around the three aspects of cluster governance, namely normative, cognitive and political. Figure 7.2 shows the structure of the cluster governance section of the survey.

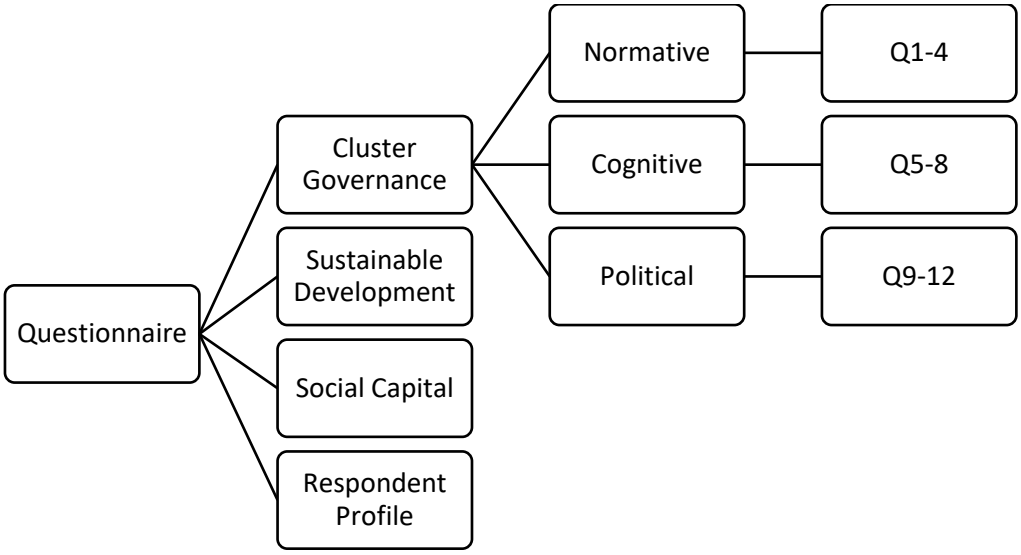

Figure 7.2 Questionnaire Layout with Emphasis on Cluster Governance Aspect
Source: Author

This part comprised twelve questions drawn from existing models of cluster governance and the interviews. The items are shown in Table 7.1, with items to be negatively worded chosen at random.

Aspect	Item
Normative	There are communities within the cluster that focus on shared goals
	The cluster management organisation facilitates collaborative projects amongst members
	There is no clear emphasis on members being drawn from the local region
	There is an explicit strategy for the cluster and their activities that is shared amongst members.
Cognitive	The cluster management organisation facilitates skills development
	The cluster management organisation facilitates the sharing of knowledge
	The cluster management organisation enables member firms to support each other
	The cluster management organisation encourages the sharing of best organisational practices
Political	There is no clear branding for the maritime sector in the region
	The cluster management organisation facilitates access to external support
	The cluster management organisation does not provide a means to resolve conflict among member firms
	The cluster management organisation has a clear strategy for attracting and developing membership

Table 7.1 Questionnaire Items for the Measurement of Cluster Governance
Source: Author

7.3.5. Part B – Sustainable Development

This part assessed the contribution made to sustainable development within the respondent's organisation by the cluster organisation. Figure 7.3 shows the structure of this part.

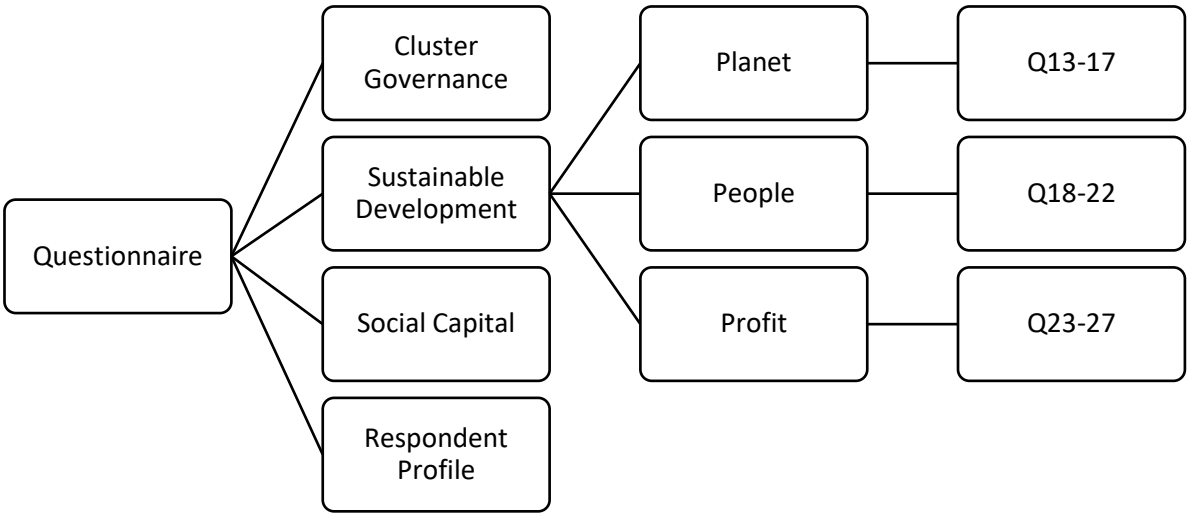

Figure 7.3 Questionnaire Layout with Emphasis on Sustainable Development Aspect
Source: Author

Table 7.2 presents the items used for the measurement of sustainable development with the wording based around the IS response principles proposed by Saris et al., (2010). The overall structure of this section was adapted from the Port Sustainability Measurement model proposed by Kuznetsov et al., (2015), supported by the sustainable business models literature.

Aspect	Linked to:	Item
Planet	Environmental Management	We actively seek to use environmental knowledge to support what we are trying to do
		We have, or are working towards having, an environmental management system in place to manage the environmental impacts of our operations
	Resource Efficiency	Our organisation strives to maximize material productivity and energy efficiency
		Our organisation seeks to create value from waste
		Our organisation tries to substitute non-renewable sources with renewable sources and natural processes
People	Stakeholder Engagement	We proactively engage with our stakeholders
		We are better able to influence our stakeholder's perceptions
		We participate in projects to benefit the local community
	Organisational & Management Processes	We have achieved management system accreditation which reflects the needs of our people and the organisation
	Skills Development	Our organisation is committed to talent management and continued learning
Profit	Economic Development	Belonging to the cluster has had a positive effect on our annual turnover
	Strategic Planning	Our strategic planning reflects our capacity to adopt sustainable development in the long term.
	Organisational & Management Processes	Our organisational processes are responsive to change e.g. coming from legislation or industry
		We are able seek out ways to be innovative in our products and business processes.
		Our business practices are efficient and cost effective

Table 7.2 Questionnaire Items for the Measurement Sustainable Development
Source: Author

7.3.6. Part C – Social Capital

Part C focused on the dynamics of the cluster, incorporating social capital and the use of social networks and relationships between organisations. This part focused on objectives 2, 3 and 4. Figure 7.4 shows the structure of part two.

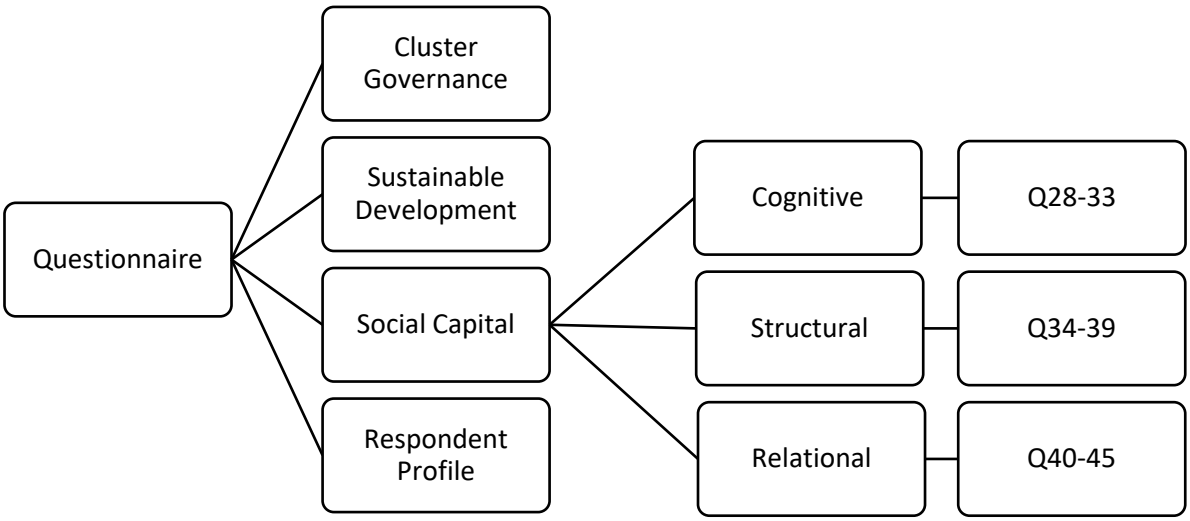

Figure 7.4 Questionnaire Layout with Emphasis on Social Capital
Source: Author

The researcher is a member of the Competitiveness Institute's Cluster Evaluation Working Group; the questions in this part are adapted from the output of that group. The group comprises academics, policymakers and cluster practitioners and represents current thinking in cluster evaluation (TCI, 2017). The questions have been peer-assessed within that group. They have been slightly amended for the purposes of this research to allow responses on a Likert-type scale.

Aspect	Item
Cognitive	We identify ourselves as part of the cluster
	We feel we are part of a collaborative effort
	In our experience, other members of the cluster are open and willing to exchange information (about e.g., suppliers, clients)
	In our experience, other members of the cluster are reluctant to exchange experience/expertise in order to tackle common issues
	When our company has a challenge that cannot be resolved in isolation, our company usually first turns to someone in the cluster to help us find a solution
	We share a common view with other members of the strategic objectives of the cluster
Structural	Working with others provides long-term benefits to our company…
	for market intelligence
	for skills and workforce development
	for product/technology development
	for access to new markets
	to influence regional policy
	to build the reputation of the sector
Relational	When our company makes contact with others about possible co-operation, we look to companies and other organisations:
	Inside the cluster
	Outside the cluster, in the region
	Outside the region
	When our company receives contact from others about possible co-operation, this contact is from companies and other organisations:
	Inside the cluster
	Outside the cluster, in the region
	Outside the region

Table 7.3 Questionnaire Items for the Measurement of Social Capital
Source: Author

7.3.7. Part D – Respondent Profile

This part contained questions designed to gather business information relating to each organisation. These questions covered the size of the organisation; length of cluster membership; the sub-sector to whom the respondent firm belonged; and the seniority of the person completing the questionnaire. Whilst not used to assess the relationships between social capital, cluster governance and

sustainable development, this data showed the characteristics of the sample. As a result, part D did not specifically address any of the research objectives.

7.4. Survey Population and Sampling Approach

There were two sampling considerations for the quantitative phase of this research: firstly, the selection of clusters to investigate; and secondly which organisations to include in the survey.

7.4.1. Cluster Selection

This research focused on maritime cluster organisations, typically instigated by policymakers to strengthen the maritime sector within their region, and uses the cluster organisation approach, defined by the European cluster Collaboration Platform (2016) as its starting point. Furthermore, the list of members and their contact details needed to be publicly available; this removed the requirement of the cluster management to provide details, overcoming data protection concerns, and reducing the potential for acquiescence bias in member firms reporting what they might believe the cluster management wanted them to say. The criteria for inclusion support the use of purposive sampling at this stage.

7.4.2. Individual Respondents

The convenience sampling technique adopted in this stage falls within the non-probability category. The use of non-probability sampling in quantitative research can lead to problems with the representativeness of the sample and difficulties in generalisability (Bryman and Bell, 2011). Peterson & Merunka (2014) argue that the issue is not one of generalisability to other populations, but generalisability to other populations with the same characteristics, and the ability to replicate such findings. In recognising this issue, and limiting generalisability to populations with

the same characteristics, the potential negative effects of purposive sampling have been largely mitigated.

There is limited evaluation of sampling approaches in the cluster literature, with no apparent consensus on approach (Schmiedeberg, 2010). An evaluation of related literature indicates that convenience or purposive sampling has often been adopted in cluster-related research (Dahl and Pedersen, 2004; Kesidou and Romijn, 2008), and is prevalent in the business and management domain (Yang, Wang and Su, 2006; Bryman and Bell, 2011). There is empirical research within the Operations and Supply Chain Management field arguing for non-probability sampling to overcome difficulties due to the specific characteristics of the data, and uncertainty in achieving the required number of samples. Cluster associations are formed around the needs of the policymakers' local realities (Martin and Sunley, 2003), resulting in different structures, priorities and market sectors, and can lead to difficulties with developing a suitable sampling frame. Such constraints related to the research topic can influence the sampling approach, resulting in non-probability sampling being appropriate (De Beuckelaer and Wagner, 2012). Furthermore, non-probability sampling is appropriate for studies that are exploratory in nature, a feature consistent with the aims of this research.

Section 6.2 examined the issue of the researcher's ability to gain meaningful data from managers when four conditions are met; these four conditions are repeated here for ease; namely that 1) the manager is able to answer the question as the topic forms part of their work, 2) questions are understandable, 3) the interview itself enables an accurate response to be provided, and 4) there is no incentive for managers to mislead (Winter, 2003).

By seeking responses from individuals within the firm closest to the cluster, and with sufficient knowledge of the topics under investigation, it is anticipated that point one has been adequately addressed. Kumar, Stern and Anderson (1993) argue that this is an appropriate approach with informants selected on the basis of their knowledge, rather than being representative of the organisation in any statistical sense. There remains debate in the literature as to the use of single v multiple informants and the impact on subsequent analysis, the use of single informants can be further justified on time and cost saving terms (Kumar, Stern and Anderson, 1993; Rong and Wilkinson, 2011; Lyu, Chen and Huo, 2019).

The issues raised in points 2 and 3 have been addressed through the pilot testing of the survey instrument (see section 7.5). Any deliberate attempt to mislead cannot be mitigated against fully, although reasonable steps to avoid the fourth point have been taken, including the survey not being distributed or officially sanctioned by the cluster organisation under investigation. This was intended to mitigate against possible desire to answer questions in such a way as to please the cluster organisation. Although these steps have been taken, there remains scope for 'key informant bias' to affect outcomes of the research.

7.4.2.1. Key Informant Bias

Having acknowledged that the use of single key informants was deemed appropriate in this research given that the subject of study requires in-depth information to be provided (Kumar, Stern and Anderson, 1993), Rong and Wilkinson (2011) highlight potential for manager's perceptions and recall to influence outcomes. As part of measures to mitigate against potential risk of bias introduced by using single informants, the selection process for the key informant included a message requesting completion by the most suitable person in the

firm given their knowledge of the firm and relationship with the cluster organisation in line with the approach adopted by Lyu, Chen and Huo (2019).

Key informant bias can be introduced for a number of reasons; these are summarised in Table 7.4.

Psychological Principles	**Description**	**Potential Implications for this Research**
Sensemaking • Cause map	• Aggregate of causal information; mental structure built by previous outcomes	
Positive illusion • Positive views of self • Illusion of control	• Recall more success than failure • Underestimate uncertainty	• Overestimate firm sustainable development performance; overestimate effect of cluster organisation on sustainable development performance; overestimate external relationships. • Underestimate factors other than cluster organisation on sustainable development performance
Attribute evaluability	• Overemphasise easy-to-evaluate attributes • Underemphasise difficult-to-evaluate attributes • Use substitute elements for perception	• Inaccurate perceptions of cluster governance, sustainable development and/or social capital.
Attribution • Discounting principle • Augmentation principle • Self serving bias	• As different causes can produce the same effect, the role of a given cause in producing the effect is discounted if other plausible causes are present • As different causes can produce the same effect, the role of a given cause in producing the effect is augmented if other inhibitory causes are present • Attribute good outcome to oneself while attribute bad outcome to external factors	• Moderating effects of cluster organisation membership on sustainable development and social capital • May attribute good sustainable development performance on own performance • May attribute poor sustainable development performance on external factors, including cluster membership

Table 7.4 Sensemaking and Implications for this Research
Source: Author, based on Rong and Wilkinson (2011, p. 142)

Some mitigation can be provided by comparing results from the quantitative phase with the preliminary qualitative phases; further discussion is in section 8.4.3. These implications do form a limitation of this research and are acknowledged in the discussion and conclusion chapters.

7.5. Pilot Study

The purpose of the pilot study was two-fold; firstly it can be viewed as being a feasibility study in advance of the main research; secondly the pilot study provides the opportunity to test the research instrument (Baker, 1994; van Teijlingen and Hundley, 2002). Within the research methodology literature, there is general consensus that the pilot study is a key final check before the main round of data collection commences (Kim, 2014).

7.5.1. Content Validity

Evaluation of the content formed the first stage of the pilot study. Twelve maritime and non-maritime (6:6) staff (including the supervisory team) and doctoral students at the Plymouth Graduate School of Management reviewed the questionnaire. A number of issues emerged, including the number of questions; single items asking multiple questions; ambiguity in questions; and the risk of method bias. In line with the advice provided by Malhotra & Birks (2007) questions were revised. These revisions included: the removal of two-part questions, meaning that one part might be true, with the other not; and structuring the questionnaire so that related questions were presented together. Examples of issues that arose during this stage, and subsequent amendments, are shown as Appendix D: Outcomes of Pilot Study First Stage.

Following this revision, the questionnaire was distributed to twelve local maritime professionals and cluster practitioners to be reviewed within the professional context. As a result of this test, four negatively worded questions were reversed as some felt that there were too many. A number of respondents commented that the purpose of the questionnaire was not entirely clear; as a result the covering

letter was revised to ensure the purpose of the questionnaire was more clearly elucidated. The final questionnaire is shown as Appendix E: Final Questionnaire

7.5.2. Reliability

Having completed these revisions, the new version of the questionnaire was distributed amongst twelve industry contacts within maritime cluster associations to assess the questions for reliability. Reliability relates to the precision and consistency of measures the scores in a sample, with the most commonly used test for reliability being the coefficient alpha, also known as Cronbach's Alpha (Kline, 2016). Cronbach's alpha measures internal consistency on a scale of 0 to 1, with scores at the higher end of the range indicating greater reliability. A typical range no less than 0.70 and no higher than 0.95 has been suggested; the lower boundary indicates satisfactory reliability, whilst the higher boundary of 0.95 is suggested in order to minimise indicator redundancy which can negatively affect content validity (Hair et al., 2019).

Typical guidance for the number of respondents suggests a sample of approximately 30. The questionnaire was distributed to 30 industry contacts, with 28 usable responses returned. The results for the Cronbach's alpha test are shown in Table 7.5.

Construct	Cronbach's Alpha
Cluster Governance Normative (CGN)	0.465
Cluster Governance Cognitive (CGC)	0.722
Cluster Governance Political (CGP)	0.260
Sustainable Development Planet (SDPL)	0.774
Sustainable Development Profit (SDPR)	0.702
Sustainable Development People (SDPE)	0.846
Social Capital Cognitive (SCC)	0.629
Social Capital Structural (SCS)	0.735
Social Capital Relational (SCR)	0.825

Table 7.5 Cronbach's Alpha Results for Pilot Test
Source: Author

Having reviewed the pilot study results, all of the items except CGN and CGP met the Cronbach's Alpha test with scores > 0.50. CGN scored 0.465, but is close, and would have been higher (0.729) had it not been for the reverse question for CGP3 and therefore more likely to be due to common method bias, and not construct consistency.

Cronbach's Alpha for CGP was the lowest at 0.260 which could suggest consistency issues. There were two reverse items in CGP that may have affected the result. At this stage they were deemed theoretically important so were retained in accordance with the advice from Hair et al., (2017), and were reviewed following full data collection.

7.6. PLS-SEM

Structural Equation Modelling is a set of data analysis techniques which allow researchers the ability to test a number of dependent relationships simultaneously (Kline, 2016; Hair et al., 2017). SEM can test the structural and measurement models as one method, thus enabling the factor analysis and the measurement of errors to be integrated (Gefen, Straub and Boudreau, 2000; Hair, Ringle and Sarstedt, 2011).

The use of SEM has become an almost *de facto* choice in marketing research (Hair et al., 2012); whilst less popular within cluster-related studies, the approach has been adopted with the area over the past few years (Lei and Huang, 2014; Rivera, Sheffi and Knoppen, 2016).

Of the variants of SEM, Partial Least Squares Structural Equation Modelling (PLS-SEM) is the most appropriate for this study. PLS-SEM is appropriate given

the prediction and theory development aspect of this work (Hair, Ringle and Sarstedt, 2011). PLS-SEM also enables complex models to be analysed in one combined process is a significant advantage over other regression models (Gefen, Straub and Boudreau, 2000). Given the minimal assumptions regarding the characteristics of the data, PLS-SEM can provide analysis without the need for multivariate normality (Gefen, Straub and Boudreau, 2000). Unlike other models, PLS-SEM is based on regressions focusing on variance, as opposed to covariance (Hair, Ringle and Sarstedt, 2011).

A further advantages of PLS-SEM is that it can also be used with a relatively small sample size (Ringle, Sarstedt and Straub, 2012); indeed it has been argued that PLS-SEM achieves higher statistical power than covariance-based models with a sample size of 100. This suggests that PLS-SEM has a greater likelihood of establishing a specific relationship when that relationship is actually significant (Hair et al., 2014).

Brewster (2011) recommends the use of non-linear regression when examining business and management related issues as it is suggested that such techniques better describe reality. This is due to the argument that phenomena in business and management research do not have a simple linear cause and effect relationship. Non-linear regression enables relationships to be identified that would otherwise have been missed. This study preferred the use of WarpPLS 6.0 (ScriptWarp Systems, 2020) over alternatives such as the PLS Graph software as it runs non-linear regression.

Given that it is a non-parametric technique, it is widely accepted, and an often stated advantage, that PLS-SEM can be used with non-normally distributed data, and that even with highly skewed data, the process can still return accurate

estimations (Goodhue, Lewis and Thompson, 2012; Hair et al., 2012; Awang, Wan Afthanorhan and Asri, 2015). A further aspect of PLS-SEM which is particularly relevant to this study is that PLS-SEM is appropriate when the nature of the research is seeking to explain a target construct (Hair et al., 2014b).

There are two stages to the evaluation of the PLS-SEM results: the evaluation of the measurement model; and the evaluation of the structural model. Sections 8.6 to 8.9 examine the results of these stages.

7.6.1. Sample Size

There are a number of methods for calculating sample size; one that has gained significant popularity over the years is the ’10-times rule’, so called because it requires a sample size 10 times greater than the “*maximum number of inner or outer model links pointing at any latent variable in the model”* (Hair, Ringle and Sarstedt, 2011 p. 144). This has advantages, especially with respect to its simplicity, but can result in inaccurate estimates (Goodhue, Lewis and Thompson, 2012). In this research, the maximum number of links pointing at any one latent variable is 2, resulting in a minimum sample size of 20 being required. Whilst particularly small, the smallest recorded in a major journal is 17 (Kock and Hadaya, 2018).

A further method proposed for calculating sample size is the R^2 method. This approach consists of three parts; the first is the maximum number of arrows pointing at a latent variable; the second is the significance level used; the third and final part is the minimum R^2 in the model (Kock and Hadaya, 2018). The sample sizes shown in Table 7.6 assumes a significance level of .05, and that power is set at .8. In order to detect an R^2 with at least 0.25, a sample size of 52 observations would be required.

Maximum Number of Arrows pointing at a construct	5% Significance level			
	Minimum R^2			
	0.10	0.25	0.50	0.75
2	110	52	33	26
3	124	59	38	30
4	137	65	42	33
5	147	70	45	36
6	157	75	48	39
7	166	80	51	41
8	174	84	54	44
9	181	88	57	46
10	189	91	59	48

Table 7.6 Table for the minimum R2 method
Source: Kock and Hadaya (2018)

A third technique for calculating a minimum sample size is the inverse square root method proposed by Kock and Hadaya (2018). Adopting this technique results in a minimum sample size of 60.38, rounded up to 61.

The number of observations in this research was 134, with 109 usable responses. 109 observations exceed the minimum under the 10-times rule (20), 59 from the R^2 method, and 61 from the inverse square root method. Given the well-documented strengths of PLS-SEM in dealing with small sample sizes, 109 response was deemed sufficient for this research.

7.6.2. Reflective and Formative Indicators

As PLS-SEM is capable of testing models that include both formative and reflective indicators, and given the implications of the different types, it is essential to decide which of the constructs have formative and/or reflective indicators (Hair et al., 2012; Kock and Mayfield, 2015). Formative (or causal) indicators are characterised by the assumption that they cause changes in the latent variable and are typically uncorrelated to each other (Diamantopoulos and Siguaw, 2006).

Given the direction of effect, the removal of one or more of the formative indicators can have a significant impact on the measurement of the construct. Reflective indicators have the opposite effect; instead of being said to cause the latent variable, the direction of causality is reversed, meaning that reflective indicators reflect the effects of the latent variable (Henseler, Ringle and Sinkovics, 2009). Decisions to use either reflective or formative indicators must be theoretically driven, with Diamantopoulos and Siguaw (2006) arguing that the choice must not be made on the outcomes of scale development. Whilst PLS-SEM is suited for analysing both reflective and formative models, and a combination of the two, the need to base choices on theoretical grounds means that only reflective indicators were used in this research.

7.7. Ethical Considerations for the Quantitative Phase

Potential respondents were contacted either by email or letter inviting them to participate in the research; this is shown as Appendix F. This enabled the recipient to make an informed decision before opening the questionnaire link or completing the hard copy. A further explanation of the nature of the research, reminder that participation was voluntary and that they could withdraw from the study was included as the first page of the questionnaire. Data was stored securely within the Qualtrics software, with downloaded data stored securely on the University of Plymouth network. Data was not removed from these, nor stored on removable drives. At the end of the analysis phase the data was deleted from the Qualtrics software.

In order for reminders to be sent, paper questionnaires were given a unique identifier. The actual identity of each respondent was known only to the researcher during the collection phase. Similarly, the Qualtrics software recorded

the email address of each respondent alongside their responses, but again these were only known to the researcher. In all cases responses were anonymised for the analysis and subsequent production of the thesis. These steps ensured the anonymity of the responses and protected the confidentiality of the respondents.

7.8. Summary

The quantitative phase of the research used self-completion online and paper questionnaires to gather data from cluster members related to cluster governance, social capital and sustainable development. The use of PLS-SEM as the analytical method for this phase was guided by the philosophical assumptions of the research and nature of the research objectives. The PLS-SEM method in turn guided the development of the questionnaire and Likert-type scales used. The next chapter presents the analysis of the data, starting with the descriptive analysis.

Chapter 8. Quantitative Analysis: Descriptive Statistics and PLS-SEM

8.1. Introduction

This chapter explores the results from the quantitative phase of the research and is divided into two sections: the first section focuses on the descriptive analysis of the data, including the characteristics of the sample: tests for response rate, non-response bias, and common method bias, and explains the significance of those tests. The second section gives the analysis of the structural equation modelling (SEM) element of this research. It is broken down further into five sub-sections: the first presents the results of the 1st Order Measurement Model, including tests for reliability, validity and collinearity; the results from the 2nd Order Measurement Model are considered next, before moving on to examine the 1st and 2nd Order Structural Models. Finally, the effect of social capital as a Mediating Variable is examined before the chapter concludes with the results of the hypothesis testing.

8.2. Sample Statistics

The questionnaires were distributed online and by post between January and September 2017.

Table 8.1 shows an overview of the response rate of the survey. The software package 'Qualtrics' was used for the distribution of the online questionnaire, including a personalised email introduction that explained the aims of the research and the ethical issues involved.

	Valid Surveys Sent[5]	Started	Submitted Responses	Response Rate
Email	727	134	108	14.86%
Postal	72	Not known[6]	26	36.11%
Total	799	134[7]	134	16.77%

Table 8.1 Questionnaire Response Statistics
Source: Author

Postal questionnaires were sent to organisations who were listed on the cluster organisation website, but who did not provide email addresses. The survey was sent to 834 organisations who met the sample criteria[8]; the criteria are shown in section 7.4. Thirty-five were discounted from the total surveys sent as either the email bounced, or the postal copy was returned by the post office. Two rounds of follow-up emails, letters and personal calls were made to non-respondents during the data collection period. Table 8.2 shows the breakdown of responses received by cluster association.

	Maritime Cluster Association								
	Maritime London	Cornwall Marine Network	Super Yacht Group	Oceans Advance	Maritime Cluster Copenhagen North	NCE CleanTech	Tasmania Marine Network	Flanders' Maritime Cluster	Swedish Maritime Technology Forum
Sent[9]	88	228	69	76	64	63	29	103	79
Received	14	48	9	16	3	12	8	15	9
%age	15.91%	21.05%	13.04%	21.05%	4.69%	19.05%	27.59%	14.56%	11.39%

Table 8.2 Response Rate by Cluster Association
Source: Author

[5] Does not include emails that bounced, nor postal questionnaires returned by post office
[6] It is not possible to know how many were started but not returned
[7] Not including postal questionnaires started but not returned
[8] This figure includes the 35 returned/bounced questionnaires, and 799 successfully sent
[9] May be lower than total number of members as a result of no contact information being available

8.3. Sample Characteristics

This section details the findings from the demographical items in the questionnaire[10] and includes the respondents' position within the organisation; sub-sector of the maritime industry to which they belong; organisation size; and history of cluster membership.

8.3.1. Sub-Sector of Respondent

Table 8.3 shows the sub-sector of the maritime industry from which responses. The majority of responses came from organisations primarily associating themselves with marine equipment and technical services. This shows that although the sample was heterogeneous, ranging from Heritage to Marine Equipment, there was some emphasis towards more technical services.

[10] Questions in this section were marked optional. These are included in the tables in this section under the category 'not stated'.

Sub-sector	Frequency	Percentage	Cumulative Percentage
Marine Equipment	18	24.00%	24.00%
Technical Services	15	20.00%	44.00%
Business Services	8	10.67%	54.67%
Ports	6	8.00%	62.67%
Shipbuilding and Repair	5	6.67%	69.34%
Financial Services	5	6.67%	76.01%
Seagoing Shipping	4	5.33%	81.34%
Yachting	2	2.67%	84.01%
Marine Renewables	2	2.67%	86.68%
Other: Not Specified	2	2.67%	89.35%
Fishing	1	1.33%	90.68%
Dredging	1	1.33%	92.01%
Local Government	1	1.33%	93.34%
Manufacturing	1	1.33%	94.67%
Marinas	1	1.33%	96.00%
Maritime Heritage	1	1.33%	97.33%
Charity	1	1.33%	98.66%
Consultancy - Non-Specific	1	1.33%	100%
Not stated	59	-	-

Table 8.3 Respondent's Industry Sub-Sector
Source: Author

8.3.2. Seniority of Respondents

The seniority of the respondent within their organisation was typically high, with some 55% of respondents at Managing Director, CEO, Owner and VP level. When including ‘managers’, that figure reaches 92%. This means that respondents have the ability to answer with authority (Rowley, 2012).

8.3.3. Size of Organisations

Questions concerning the size of organisations were based on the definitions provided by the European Commission (2014), with the measures, and responses shown in Table 8.4.

Size Measure	Frequency	Percentage
No. of Employees		
Micro	40	46.51%
Small	24	27.91%
Medium	13	15.12%
Large	9	10.47%
Not stated	48	-
Latest Recorded Turnover		
≤£1.7m	45	57.69%
≤£8.7m	13	16.67%
≤£43.7m	11	14.10%
>£43.8m	9	11.54%
Not stated	56	-

Table 8.4 Organisation Size
Source: Author

The majority of respondents are considered as micro and small enterprises, both in terms of turnover and number of employees. Approximately 11% of respondents could be considered as large organisations. SMEs form a significant part of empirical work in the cluster literature, see Morosini (2004); Knauseder (2009); Rialland (2009); Huber (2011); and Rebelo & Caldas (2013).

8.3.4. Length of Cluster Membership

Years	Frequency	Percentage
<1 year	3	3.61%
2-5 years	37	44.58%
6-9 years	13	15.66%
>10 years	30	36.14%
Not stated	51	-

Table 8.5 Length of Cluster Membership
Source: Author

Table 8.5 shows for how long respondent organisations have been members of their respective clusters. Two categories contained the highest frequency of responses, 2-5 years' membership accounted for nearly 45% of respondents, closely followed by >10 years, with 36% of respondents.

8.4. Sampling Issues

There are a number of issues that can arise during the collection of data that can affect the reliability and validity of the sample. A number of tests were undertaken to determine the extent of any possible issues and are explained in this section.

8.4.1. Non-Response Bias

Non-response bias occurs when there is a systematic significant difference between respondents and non-respondents (Sedgwick, 2014). There are different methods to assess the non-response error, with Armstrong & Overton (1977) recommending the comparison of early respondents to late respondents. They argued that early respondents are those willing to participate in surveys, whereas late respondents share similar traits to non-responders given their delay in responding. A review of literature related to this research found that the comparison method offered by Armstrong & Overton (1977) was the typical

approach (Elche-Hotelano, 2011; Weinzimmer, Michel and Franczak, 2011; Chen and Hung, 2014; Das, 2016).

The 108 usable responses were divided into two groups, namely early responders (n=30, 27.8%) and late responders (n=30, 27.8%). A t-test with 0.05 significance level was performed on the two groups' responses to 15 randomly selected items; there was no significant difference between the two groups' responses to any item. As a result, non-response bias is not of concern to this research.

8.4.2. Method Bias

Method bias refers to systematic measurement errors that affect the way in which respondents complete questionnaires (MacKenzie and Podsakoff, 2012). A number of steps were taken in the development of the questionnaire and are discussed in chapter 6. Harman's single-factor test was used to test for common method bias after data collection was completed. This test demonstrates bias if the single factor that emerges from the factor analysis accounts for >50% of variances in the model. The first factor accounted for 23.7% of variances, less than the 50% 'limit'. Combined with the measures taken during the development of the questionnaire, the results of this test indicate an absence of method bias in the findings.

8.4.3. Key Informant Bias

Section 7.4.2.1 examined issues of key informant bias and indicated steps taken to mitigate against it. Whilst it is recognised that inferring causality when analysing cross-sectional data can be problematic, insights from the preliminary qualitative phase, which are generally consistent with the survey results, have

been used to provide additional support for the findings (Rong and Wilkinson, 2011; Abbey, Tomlinson and Branston, 2016).

8.4.4. Convenience Sampling and Generalisability

Bryman & Bell (2011) argue that using non-probability sampling can lead to difficulties in generalisability. A possible action to mitigate those concerns is offered by Peterson & Merunka (2014) who in suggesting that the issue relates to replication and generalisability to other populations with the same characteristics rather than generalisability to other populations, suggest that empirical replications can be used to assess generalisability.

Responses from two different clusters were compared by performing a t-test with 0.05 significance level on the two groups' responses to all questionnaire items. The results show that of the 45 items, 40 showed no significant difference between the two groups, indicating generalisability between populations with similar characteristics.

8.4.5. Missing Data and Outliers

Although the online questionnaire was set up to require all questions to be answered before moving on to the next page, the possibility of incomplete responses remained. The use of postal questionnaires added to this possibility. Missing data generally arises when participants accidentally miss out questions, feel unable to answer questions, or sometimes deliberately ignore questions (Field, 2009). Using the 'Arithmetic Mean Imputation' method, the WarpPLS-SEM software will replace missing values with the mean of the other scores of that factor (Kock, 2017). This is the most widely used approach, and whilst it is argued that it is a relatively reliable method, and can reasonably account for up to 20% of missing values (Kock, 2014; Girod, Mayer and Nägele, 2017), Hair et al.,

(2017) suggest that it is typical for observations to be removed when in excess of 15% of data is missing. Of the 144 submitted responses, 38 were incomplete. All of those responses were omitted as the missing data exceeded 15%.

Outliers are scores that are quite different to the rest of the data, and can influence parameters such as the mean and standard deviation, resulting in an overall bias (Field, 2009). Outliers are typically retained given that they represent part of the population and can provide a more complete explanation of the relationship *(*Hair et al., 2017; Kock, 2017). It is argued that they should only be removed if there is a genuine measurement error (Kock, 2017).

8.5. Descriptive Statistics for the Main Questions

This section shows the descriptive analysis of the questions from the survey for sustainable development, social capital and cluster governance.

8.5.1. Cluster Governance

Table 8.6 shows the items used in the measurement of cluster governance and their abbreviations. The abbreviations are in the analysis to simplify the presentation of results.

Construct	Sub-Dimension	Indicators	Description
Cluster Governance	Normative	CGN1	Communities within the cluster with shared goals
		CGN2	Facilitation of collaborative projects
		CGN3	Membership base within the local region
		CGN4	Clear and shared cluster strategy
	Cognitive	CGC1	Facilitation of skills development
		CGC2	Facilitation of knowledge sharing
		CGC3	Cluster management enables members to support each other
		CGC4	Cluster management encourages sharing of best organisational practice
	Political	CGP1	Clear branding for the local maritime sector
		CGP2	Enabling access to external support
		CGP3	Conflict resolution system in place
		CGP4	Strategy for attracting and developing membership

Table 8.6 Abbreviation of Cluster Governance Items
Source: Author

In assessing cluster governance, respondents were asked to rate their perception of the governance of their cluster on a five-point Likert-type scale from 'Disagree' (1) to 'Agree' (5), using the items in Table 8.6. The results are shown in Table 8.7 below.

There is a debate in the literature regarding the reporting of the mean when using Likert-type scales and whether the data obtained should be treated as continuous or ordinal (Sullivan and Artino, 2013). If data is to be treated as ordinal then it has been argued that using the mean may not be appropriate. However, the counterargument that data can be treated as continuous is typical in business research. The mean is presented here as an indicator of the responses. The

Standard Deviation is presented as a proxy for the homogeneity of the sample, with a lower SD representing greater homogeneity. The frequency distributions are shown to demonstrate the spread of responses across each of the items. Tests for validity and reliability occur during the PLS-SEM phase of the research.

Construct	Item	Response Scale Distribution					Mean	SD
		1	2	3	4	5		
Cluster Governance	CGN1	0.94%	4.72%	9.43%	45.28%	39.62%	4.18	0.86
	CGN2	1.89%	6.60%	19.81%	43.40%	28.30%	3.90	0.96
	CGN3	6.60%	16.98%	28.30%	28.30%	19.81%	3.38	1.17
	CGN4	11.32%	7.55%	24.53%	39.62%	16.98%	3.43	1.20
	CGC1	2.83%	12.26%	21.70%	36.79%	26.42%	3.72	1.08
	CGC2	2.83%	7.55%	16.04%	43.40%	30.19%	3.91	1.01
	CGC3	2.83%	4.72%	22.64%	46.23%	23.58%	3.83	0.94
	CGC4	8.49%	5.66%	33.96%	36.79%	15.09%	3.44	1.09
	CGP1	12.26%	24.53%	14.15%	31.13%	17.92%	3.18	1.32
	CGP2	1.89%	16.04%	24.53%	39.62%	17.92%	3.56	1.02
	CGP3	13.21%	20.75%	53.77%	9.43%	2.83%	2.68	0.92
	CGP4	4.72%	11.32%	34.91%	27.36%	21.70%	3.50	1.10

Table 8.7 Descriptive Statistics for Cluster Governance
Source: Author

The assessment of cluster governance indicates the following:

1. 84.9% agreed that there are communities within the clusters that focus on shared goals (CGN1), although only 56.6% agree that there is an explicit, shared strategy for the cluster (CGN4).

2. 71.7% agree that the cluster management facilitates collaborative projects between members, with a similar percentage (69.8%) agreeing that the cluster management enables members to support each other.
3. The cluster organisations' strategies towards membership tended to score low, with 48.1% agreeing that there was clear emphasis on members being drawn from the local region (CGN3), and 49.1% agreeing that there is a clear strategy for attracting and developing membership (CGP4); approximately 16% disagreed.
4. In business development terms, 63.2% agreed that the cluster enhanced skills development (CGC1); 57.5% agreed that the cluster facilitated access to external support (CGP2); 51.9% agreed that the cluster management encouraged the sharing of best organisational practices (CGC4); and 73.6% agreed that the management facilitated the sharing of knowledge (CGC2).
5. The lowest agreement related to the implementation of a conflict resolution process, with only 12.3% agreeing that such a process existed (CGP3).

The findings from the cluster governance assessment indicate that the typically stated benefits of being part of a cluster were present, including knowledge sharing, collaborative projects and communities of shared interests/goals. It was beyond the scope of this research to examine the clusters in lifecycle terms, so this may represent clusters in the earlier stages of their lifecycle. The political aspect of cluster governance scored the lowest overall, again supporting the need for further investigation in lifecycle terms.

The next part of the questionnaire focused on the perceived contribution of cluster membership on sustainable development.

8.5.2. Sustainable Development

Table 8.8 shows the items used in the measurement of sustainable development and their abbreviations. As before, the abbreviations are in the analysis to simplify the presentation of results.

Construct	Sub-Dimension	Indicators	Description
Sustainable Development	Planet	SDPL1	Environmental knowledge is used in support of work
		SDPL2	Environmental management system in place or working towards
		SDPL3	Maximisation of material productivity and energy efficiency
		SDPL4	Creation of value from waste
		SDPL5	Substitution of non-renewable sources for renewable sources
	People	SDPE1	Proactive engagement with stakeholders
		SDPE2	Ability to influence stakeholder's perceptions
		SDPE3	Participation in projects to benefit the local community
		SDPE4	Management system accreditation achieved or in progress
		SDPE5	Commitment to talent management and continued learning
	Profit	SDPR1	Positive effect on turnover
		SDPR2	Strategic planning contributes to Sustainable development adoption
		SDPR3	Organisational processes responsive to change
		SDPR4	Innovation in products and processes
		SDPR5	Efficient and cost-effective business processes

Table 8.8 Abbreviation of Sustainable Development Items
Source: Author

In assessing the perceived impact that cluster membership had on Sustainable development in their organisations, respondents were asked to rate their perception of impact on a five-point Likert-type scale from 1 (lowest or not applicable) to 5 (highest), using the items in Table 8.8.

Table 8.9 shows the descriptive statistics for the sustainable development part of the survey, including the frequency distribution, mean and standard deviation.

Construct	Item	Response Scale Distribution					Mean	SD
		1	2	3	4	5		
Sustainable Development	SDPL1	17.92%	13.21%	19.81%	23.58%	25.47%	3.25	1.43
	SDPL2	26.42%	11.32%	16.98%	14.15%	31.13%	3.12	1.60
	SDPL3	11.32%	12.26%	25.47%	25.47%	25.47%	3.42	1.30
	SDPL4	21.70%	19.81%	16.98%	21.70%	19.81%	2.98	1.45
	SDPL5	16.98%	15.09%	27.36%	22.64%	17.92%	3.09	1.33
	SDPE1	10.38%	5.66%	15.09%	38.68%	30.19%	3.73	1.25
	SDPE2	11.32%	8.49%	20.75%	45.28%	14.15%	3.42	1.18
	SDPE3	14.15%	10.38%	20.75%	33.02%	21.70%	3.38	1.32
	SDPE4	29.25%	12.26%	24.53%	16.98%	16.98%	2.80	1.46
	SDPE5	3.77%	11.32%	16.98%	31.13%	36.79%	3.86	1.15
	SDPR1	16.98%	16.04%	33.02%	20.75%	13.21%	2.97	1.26
	SDPR2	10.38%	14.15%	26.42%	23.58%	25.47%	3.40	1.29
	SDPR3	12.26%	17.92%	20.75%	25.47%	23.58%	3.30	1.34
	SDPR4	13.21%	0.94%	16.04%	30.19%	39.62%	3.82	1.33
	SDPR5	7.55%	8.49%	23.58%	42.45%	17.92%	3.55	1.11

Table 8.9 Descriptive Statistics for Sustainable Development
Source: Author

The assessment of sustainable development indicates the following:

1. The greatest perceived impact was on the ‘People’ aspect of sustainable development (SDPE1-5, $\bar{x}$ = 3.44). The lowest impact was on the ‘Planet’ aspect (SDPL1-5, $\bar{x}$ = 3.17).
2. Within the ‘People’ aspect, the highest scoring indicators related to proactive stakeholder engagement (SDPE1), with 68.9% of responses higher than the mean ($\bar{x}$ = 3.73); and commitment to talent management and continued learning (SDPE5), with 67.9% of responses higher than the mean ($\bar{x}$ = 3.86). The lowest scoring indicator within this section related to management system accreditation (SDPE4), with a low mean ($\bar{x}$ = 2.80) and 58.5% of responses above it. This may be due to the relatively large number of small and medium enterprises who participated, see section 8.3, and the perceived burden of accreditation (Mulhaney, Sheehan and Hughes, 2004; Psomas, Kafetzopoulos and Fotopoulos, 2010).
3. The lowest scoring indicator within ‘Profit’ aspect related to the perceived impact on turnover (SDPR1) ($\bar{x}$ = 2.97), with the highest being innovation (SDPR4) ($\bar{x}$ = 3.82). The innovation score fits with the concept of clusters driving innovation (Xie, Wu and Ma, 2016; Marra, Antonelli and Pozzi, 2017).
4. Within the lowest scoring ‘Planet’ aspect, the greatest perceived impact was on the maximisation of material productivity and energy efficiency (SDPL3) ($\bar{x}$ = 3.42), continuing the higher scoring product and process innovation items. Two items in the middle of the scores related to the use of environmental knowledge (SDPL1) ($\bar{x}$ = 3.25) and having, or working

towards, an environmental management system (SDPL2) ($\bar{x}$ = 3.12), again reflecting the perceived burden of accreditation (Cassells, Lewis and Findlater, 2011). The lowest scoring item was the creation of value from waste (SDPL4) ($\bar{x}$ = 2.98).

The findings from the sustainable development assessment indicate that perceptions of impact were generally in line with the literature focusing on cluster-related innovation, and areas of regional engagement.

The next section concludes the descriptive analysis of the questionnaire by examining the results from the social capital section.

8.5.3. Social Capital

Table 8.10 shows the items used in the measurement of social capital and their abbreviations.

Construct	Sub-Dimension	Indicators	Description
Social Capital	Cognitive	SCC1	Identifying as part of the cluster
		SCC2	Identifying with a wider collaborative effort
		SCC3	Experienced other cluster members being open and willing to share information
		SCC4	Experienced other cluster members being willing to share experience and expertise
		SCC5	Organisation seeks initial support from other cluster members
		SCC6	Sharing a common view of the cluster's strategic objectives
	Structural	SCS1	Working with others provides long-term benefits for market intelligence
		SCS2	Working with others provides long-term benefits for skills and workforce development
		SCS3	Working with others provides long-term benefits for product/technology development
		SCS4	Working with others provides long-term benefits for access to new markets
		SCS5	Working with others provides long-term benefits to influence regional policy
		SCS6	Working with others provides long-term benefits to build the reputation of the sector
	Relational	SCR1	Initial co-operation contact initiated with organisations inside the cluster
		SCR2	Initial co-operation contact initiated with organisations outside the cluster, in the region
		SCR3	Initial co-operation contact initiated with organisations outside the region
		SCR4	Initial co-operation contact received from organisations inside the cluster
		SCR5	Initial co-operation contact received from organisations outside the cluster, in the region
		SCR6	Initial co-operation contact received from organisations outside the region

Table 8.10 Abbreviation of Social Capital Items
Source: Author

When assessing social capital, respondents were asked to rate their perception of the statements summarised in Table 8.10 on a five-point Likert-type scale from 'Strongly Disagree' (1) to 'Strongly Agree' (5). The frequency distribution, mean and standard deviation are shown in Table 8.11.

Construct	Item	Response Scale Distribution					Mean	SD
		1	2	3	4	5		
Social Capital	SCC1	1.89%	6.60%	14.15%	46.23%	31.13%	3.98	0.95
	SCC2	1.89%	7.55%	22.64%	49.06%	18.87%	3.75	0.91
	SCC3	1.89%	11.32%	27.36%	48.11%	11.32%	3.56	0.91
	SCC4	1.89%	23.58%	34.91%	34.91%	4.72%	3.17	0.91
	SCC5	16.98%	14.15%	28.30%	34.91%	5.66%	2.98	1.19
	SCC6	0.94%	7.55%	35.85%	39.62%	16.04%	3.62	0.88
	SCS1	2.83%	4.72%	20.75%	35.85%	35.85%	3.97	1.01
	SCS2	1.89%	4.72%	26.42%	43.40%	23.58%	3.82	0.91
	SCS3	3.77%	4.72%	32.08%	37.74%	21.70%	3.69	0.99
	SCS4	2.83%	4.72%	26.42%	40.57%	25.47%	3.81	0.97
	SCS5	2.83%	2.83%	20.75%	40.57%	33.02%	3.98	0.96
	SCS6	0.94%	1.89%	17.92%	36.79%	42.45%	4.18	0.86
	SCR1	0.94%	6.60%	30.19%	45.28%	16.98%	3.71	0.86
	SCR2	1.89%	3.77%	29.25%	45.28%	19.81%	3.77	0.88
	SCR3	4.72%	6.60%	26.42%	35.85%	26.42%	3.73	1.07
	SCR4	1.89%	4.72%	42.45%	34.91%	16.04%	3.58	0.88
	SCR5	0.94%	1.89%	44.34%	32.08%	20.75%	3.70	0.85
	SCR6	0.94%	6.60%	42.45%	30.19%	19.81%	3.61	0.91

Table 8.11 Descriptive Statistics for Social Capital
Source: Author

The assessment of social capital indicates the following:

1. There was a general view that working with others had long-term benefits (SCS1-6), although of the six items, the lowest score related to product/technology development (SCS3) with 59.4% in agreement. The

highest rated at 79.25% agreeing was related to the benefits of working with others to build reputation of the sector (SCS6).

2. Identifying with the cluster (SCC1) and feeling part of a collaborative effort (SCC2) scored the highest of the normative section of social capital with $\bar{x}$ = 3.98 and 3.75 respectively.
3. The lowest scores of the normative section related to sharing expertise/experience (39.6% agreeing, $\bar{x}$ = 3.17) and agreement with attempting to find solutions within the cluster was only 40.6% ($\bar{x}$ = 2.98).
4. SCR1-6 related to the making and receiving of contact about possible co-operation. The lowest scores of this section were for contact made (SCR1) and received (SCR4) from inside the cluster, with $\bar{x}$ = 3.71 and 3.58 respectively, compared to slightly higher figures for outside the cluster but within the region ($\bar{x}$ = 3.77 and 3.70) and outside the region ($\bar{x}$ = 3.73 and 3.61). The strongest score here was outside the cluster but within the region, indicating the potential for the regional cluster organisation.

The findings from the social capital assessment indicate that there is a belief in the long-term benefit of working with others, a feeling of identity and being part of a collaborative effort. The next section provides descriptive analysis and commentary of the differences between clusters.

8.5.4. Comparison between Cluster Associations

Whilst the dataset is too small to enable appropriate statistical comparisons between clusters, this section provides a descriptive review of the differences. The results may be skewed as a result of the response rates, so this section is provided to enable variation between clusters to be recognised and commented

on. Figure 8.1 shows a comparison of perceptions of cluster governance from each of the nine clusters used in this research.

Figure 8.1 Perceptions of Cluster Governance (by Cluster)
Source: Author

Figure 8.2 Key to Figure 8.1, 8.3 and 8.4
Source: Author

The pattern of responses is largely similar across the nine clusters. The Swedish Maritime Technology Forum is a slight outlier, recording responses to indicators which were lower than from the majority of other clusters. This is particularly noticeable for the facilitation of knowledge sharing, facilitation of skills

development, having communities of shared goals and enabling access to external support. There were stronger responses for focus on local membership, facilitating collaborative projects, and branding. This may be explained by their particular focus as they emphasise collaboration throughout their literature (Swedish Maritime Technology Forum, 2021).

With this exception, the pattern of responses was largely similar, with generally higher marks around issues of shared goals, facilitation of collaborative projects, skills development and knowledge sharing, and mutual support. This appears to be in line with the cluster literature.

Indicators of sustainable development form the basis of the next comparison. Figure 8.3 shows the comparison by cluster for each indicator of sustainable development.

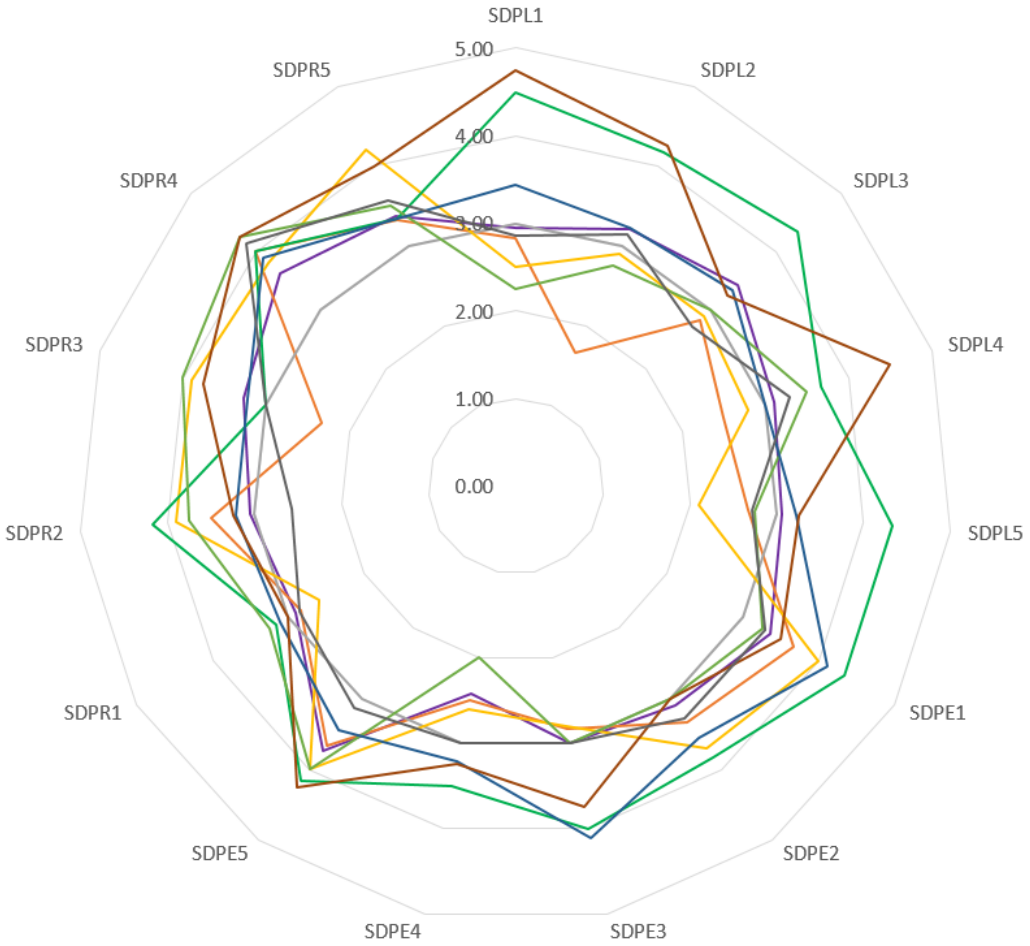

Figure 8.3 Indicators of Sustainable Development (by Cluster)
Source: Author

Although the pattern of responses is similar, the comparison indicates wider variation between clusters than for cluster governance or social capital.

NCE Maritime CleanTech had the highest combined mean for sustainable development indicators; with the Swedish Maritime Technology Forum second to them. Of the nine clusters surveyed, NCE Maritime CleanTech had the clearest focus on developing sustainable innovation amongst their member firms, whilst the Swedish Maritime Technology Forum had the clearest focus amongst the remaining eight clusters.

As shown in Table 8.9, the effect of cluster membership on turnover was one of the lowest scores across all clusters. The range between highest and lowest

mean was the lowest of all indicators; there are two points that emerge from this; the first is the difficulty in attributing economic contribution to cluster membership (this point emerged during the preliminary qualitative phase as well), and secondly that clusters provide benefits beyond turnover. This is consistent with empirical work from Pavelkova et al., (2021) who found little evidence to support positive impacts on financial performance of clustered firms.

The planet sub-dimension focused on environmental issues, including resource use and use of environmental knowledge in business activities. Amongst the clusters Maritime London had the second lowest mean for indicators within this dimension, although they had amongst the highest means for both people and profit sub-dimensions. This may be as a result of Maritime London being a largely business-services oriented cluster comprising firms without direct environmental implications for their work.

The final part of this section begins with Figure 8.4 showing a comparison of each social capital indicator by cluster. Abbreviated indicators are shown for clarity and are those shown in Table 8.10 from section 8.5.3.

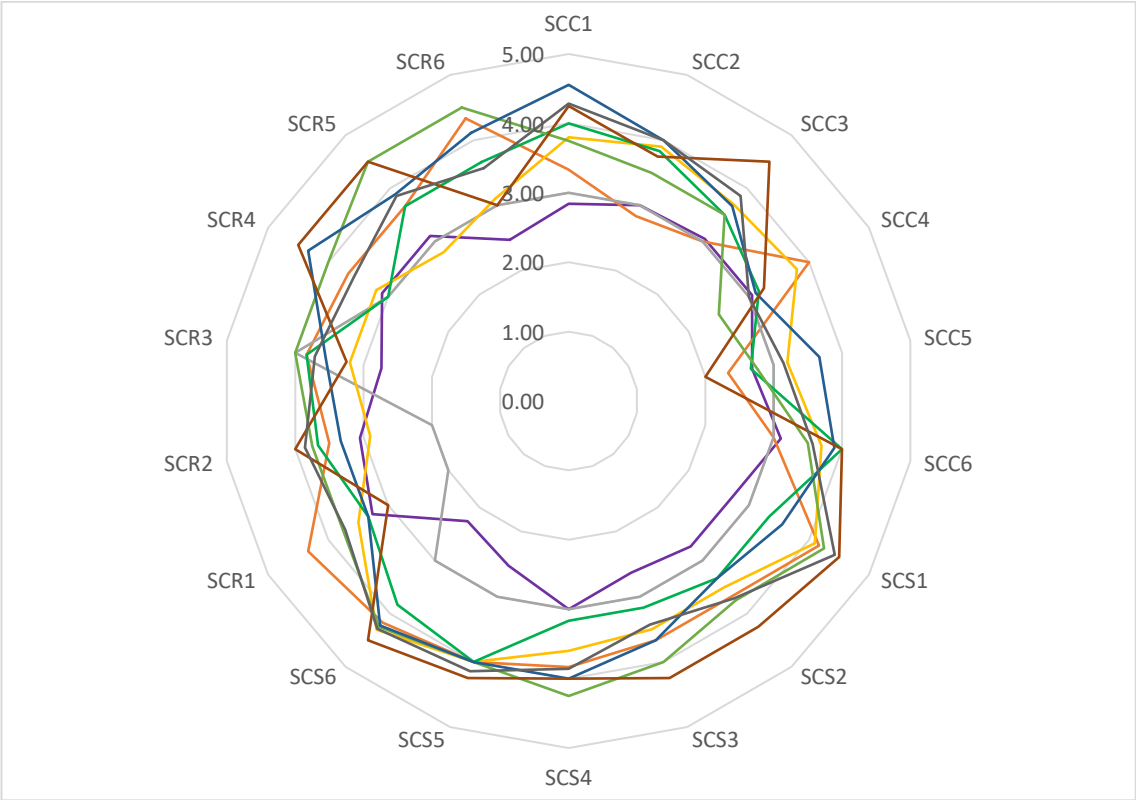

Figure 8.4 Indicators of Social Capital (by Cluster)
Source: Author

These results show relatively wide variation in indicators between clusters. The widest variation occurred in the relational social capital construct; this suggests that whilst cluster organisations may place emphasis on the abilities of firms within their region, firms will when appropriate, work with others outside the cluster, and region. This is linked to the global pipelines/local buzz debate.

Cornwall Marine Network had the lowest combined mean of all three dimensions of social capital; this may be as a result of the wide diversity of membership base which has resulted in relatively high unrelated variety and greater distance in cognitive proximity. Clusters exhibiting higher levels of social capital tended to have greater related variety and sectoral focus, such as OceansAdvance, Super Yacht Group and Swedish Maritime Technology Forum. With the exception of the Cornwall Marine Network (formed 2002), relatively older clusters had higher

combined means of the three social capital dimensions. This is unsurprising given that relationships, trust and mutual understanding take time to develop.

8.5.5. Descriptive Summary

This part presented the preliminary descriptive analysis of the data. This analysis provided a general overview of the data collected, and enabled testing for non-response and method biases. A total of 106 usable responses was obtained, indicating a response rate of 13.2%. Section 8.3 showed the results of the t-test which indicated that non-response bias is unlikely to be a factor in this research, and the Harman's single factor test showing that common method bias is not of concern in the study.

The descriptive analysis showed that for cluster governance, the items with the highest means were that the clusters enabled communities with shared goals (4.18/5), the facilitation of knowledge sharing (3.91/5) and the facilitation of collaborative projects (3.90/5). The lowest mean in this section referred to the clusters having conflict resolution systems in place (2.68/5).

In respect of sustainable development, the greatest perceived impact was on the 'People' aspect (SDPE1-5, $\bar{x}$ = 3.44). The lowest impact was on the 'Planet' aspect (SDPL1-5, $\bar{x}$ = 3.17).

Turning to social capital, the descriptive analysis showed that there was general consensus that working with others yielded long-term benefits, and that clusters delivered a sense of identity and shared purpose.

The final part of section 8.5 compared descriptive statistics for each of the indicators by cluster. Clusters with greater emphasis on sustainable innovation tended to outperform others in terms of sustainable development, whilst older

clusters typically exhibited higher levels of social capital. Key cluster objectives such as collaboration, communities of shared goals and accessing support tended to be highly ranked indicators in the governance dimension.

Section 8.6 presents the analysis of the 1st order measurement models using PLS-SEM.

8.6. 1st Order Measurement Model Results

This section focuses on the tests for reliability, validity and collinearity relevant to the 1st order measurement model. The measurement, or outer, model is used to assess the relationships between indicators and their construct (Hair et al., 2014).

8.6.1. Reliability of Individual Items

In order to evaluate the individual item reliability of reflective indicators, the indicator's loadings should be reviewed (Hulland, 1999). Hair et al., (2017) suggest that as a rule of thumb only indicators with loadings of 0.708 or higher should be retained. This is so the latent variable explains a considerable part of each indicator's variance, typically a minimum of 50%. The loading value of 0.708 is appropriate as $0.708^2 = 50\%$. This is normally rounded down to 0.70. A higher boundary of 0.95 is also proposed in order to minimise indicator redundancy which can negatively affect content validity (Hair et al., 2019).

The initial indicator loadings are shown as Appendix G: Initial Indicator Loadings. When the loadings are between 0.50 and 0.70 other measures, including Composite Reliability, Cronbach's Alpha and AVE should be referred to; if these are within acceptable limits then the items should be kept (Hair et al., 2017). The loadings marked in yellow are lower than 0.50, whilst those in green are between 0.50 and 0.70. On reviewing those loadings, it became apparent that both SCC5

'Organisation seeks initial support from other cluster members' and SDPR1 'Positive effect on turnover' should be retained for its importance with those higher than 0.50 also retained for theoretical reasons. The remaining items lower than 0.50 were removed; these are shown in Table 8.12. All of those removed can theoretically be linked to other indicators. CGP3 was removed

Indicator	Description
CGN3	Membership base within the local region
CGP3	Conflict resolution system in place
SDPL4	Creation of value from waste
SDPR3	Organisational processes responsive to change
SCC4	Experienced other cluster members being willing to share experience and expertise

Table 8.12 Indicators Removed
Source: Author

Having removed those indicators, loadings were assessed again, with the findings presented as Appendix H: Indicator Loadings Post-Review.

8.6.2. Validity of the Measurement Model

This section focuses on the approaches to validity and reliability within the context of the PLS-SEM method and explains how validity and reliability was measured in this research.

Validity is defined as being the level of *"soundness of inferences"* (Kline, 2016 p. 93) and the extent to which a construct *actually* measures what it is *intended* to measure[11] (Hair et al., 2017). There are numerous sources of error in social science research including poorly worded questions and the incorrect application of a statistical method (Hair et al., 2017). Table 8.13 summarises the different types of validity, which are further explored in the next sections.

[11] Author's emphasis

Validity	Description	Method
Content validity	Does the measure adequately measure the concept?	Expert judgment
Internal consistency	How well do the items measure particular variables in the model?	Cronbach's alpha; composite reliability
Convergent validity	Do two instruments measuring the concept correlate highly?	Indicator reliability: average variance extracted
Discriminant validity	Does the measure have a low correlation with a variable that is supposed to be unrelated to this variable?	Cross-loadings; Fornell-Larcker criterion

Table 8.13 Evaluation Techniques for the Measurement Model
Source: Author, based on Hair et al., (2017) and (Sekaran and Bougie, 2009)

8.6.2.1. Content validity

Content validity is referred to as the representativeness of the phenomenon they are intended to measure (Kline, 2016). Whilst content validity is an essential part of the overall evaluation of the measurement model, it is a test that relies on expert judgment by the researcher and others (Kline, 2016). Whilst relying on expert judgment, there remains a risk of error in that judgment (Diamantopoulos et al., 2012). Content validity is said to be good if the development of the research instrument involves a representative sample of the subjects concerned. Sekaran and Bougie (2009), also argue that if the constructs are measured by a significant number of items, content validity is likely to be higher.

There are however no statistical measures to assess content validity; although the researcher can mitigate concerns by using multiple items to comprehensively measure the constructs. Content validity can only be

subjectively assessed by examining the processes and procedures by which the research instrument was developed (Seo, 2014).

8.6.2.2. Internal Consistency

Of the statistical evaluation techniques used in PLS-SEM, the measurement of internal consistency is the first test. Many academics traditionally use Cronbach's alpha for this test of reliability; this technique estimates reliability based on the inter-correlations of the observed indicator variables (Hair et al., 2017). There are limitations to the use of Cronbach's alpha with PLS-SEM given the way in which PLS-SEM prioritizes indicators on the basis of their individual reliability, and that it can be sensitive to the number of items in the scale.

A further measure that can be used to assess internal consistency is composite reliability (Hair et al., 2019). Composite reliability can be viewed as an *"indicator of the shared variance among the observed variables used as an indicator of a latent construct"* (Fornell and Larcker, 1981).

Composite reliability is measured on a scale between 0 and 1, with results closer to 1 indicating higher internal consistency. Whilst a composite reliability of >0.90 has been suggested as undesirable (Diamantopoulos et al., 2012; Hair et al., 2019), composite reliability measures of 0.60 and 0.70 in exploratory research, and 0.70 and 0.90 in explanatory research are deemed satisfactory (Hair et al., 2017). In terms of the Cronbach's alpha measure, Hair suggests that values greater than 0.70 signifies satisfactory reliability. Table 8.14 shows the composite reliability and Cronbach's Alpha results. Whilst the Cronbach's Alpha for GovPol is 0.631, lower than the 0.70 threshold, it is acceptable as the Composite Reliability is satisfactory.

	Composite Reliability	Cronbach's Alpha
GovNorm	0.862	0.758
GovCog	0.884	0.824
GovPol	0.803	0.631
SDPlanet	0.88	0.818
SDPeople	0.886	0.836
SDProfit	0.839	0.739
SocCapCog	0.841	0.759
SocCapStr	0.906	0.875
SocCapRel	0.854	0.793

Table 8.14 Composite Reliability and Cronbach's Alpha Results
Source: Author

8.6.2.3. Convergent Validity

Convergent validity is the measure of the extent to which two indicators that are designed to measure the same construct are correlated (Hair et al., 2017). The evaluation of convergent validity is based on the outer loadings of the indicators, and average variance extracted (AVE).

Construct validity exists when the outer loadings are all significant, meaning that the factor loading is different from zero in accordance with the t-values (Seo, 2014) and where the AVE is greater than 0.50. An AVE of greater than 0.50 suggests that the latent construct can explain more than 50% of its indicator’s variance.

	AVE
GovNorm	0.676
GovCog	0.656
GovPol	0.579
SDPlanet	0.647
SDPeople	0.613
SDProfit	0.578
SocCapCog	0.524
SocCapStr	0.617
SocCapRel	0.501

Table 8.15 AVEs of the Latent Variables
Source: Author

Table 8.15 shows that all of the AVEs are greater than 0.50, meaning that there is construct validity.

8.6.2.4. Discriminant Validity

Discriminant validity refers to extent to which the construct is distinct from other constructs (Hair et al., 2017). This means that individual items used to measure one individual variable should not measure another individual variable simultaneously. The assessment of discriminant validity is usually based on two measures: firstly, the cross-loadings, and secondly the Fornell-Larcker criterion.

Hair et al., (2017 p. 115) states that "*an indicator's outer loading on the associated construct should be greater than any of its cross-loadings on other constructs.*" Cross-loadings that exceed that of the outer loadings suggest that the construct in question is overly similar to another.

The Fornell-Larcker criterion compares the square root of the AVE values with the latent variable correlations. To establish discriminant validity, the square root of each construct's AVE should be higher than its highest correlation with any other construct (Hair et al., 2017). It has been argued that the Fornell-Larcker criterion examines discriminant validity at the latent variable level, whilst the cross loading criterion examines discriminant validity at the indicator level (Henseler, Ringle and Sinkovics, 2009). Appendix I: Discriminant Validity: Square Roots of AVEs.

8.6.3. Collinearity Test

Collinearity refers to the correlation between indicators; high correlation between indicators can have significant effects on the analysis (Hair et al., 2017). Kock and Lynn (2012) suggest using the full Variance Inflation Factor (VIF) for each construct to assess the full collinearity; as a rule of thumb, a full VIF <5 is desirable.

Table 8.16 shows the full collinearity (Full VIFs) for each of the variables. All VIFs are below the threshold of five, suggesting that there are no collinearity issues between the constructs.

	Full VIFs
GovNorm	2.271
GovCog	2.631
GovPol	1.722
SDPlanet	2.446
SDPeople	2.956
SDProfit	2.724
SocCapCog	1.665
SocCapStr	1.561
SocCapRel	1.403

Table 8.16 Full VIFs for 1st Order Measurement Model
Source: Author

8.7. 2nd Order Measurement Model Results

This study used formative second order constructs which, as advised by Hair, Ringle and Sarstedt (2011), were assessed using the loadings of the indicators and VIFs. Second order constructs were used to combine the related first order constructs to create a simplified structural model. Table 8.17 presents VIFs for the second order formative variables; all p values and VIF are less than the threshold of 5.

	Full VIFs	P value
GovNorm	1.889	<0.001
GovCog	1.799	<0.001
GovPol	1.654	<0.001
SDPlanet	2.312	<0.001
SDPeople	2.692	<0.001
SDProfit	2.257	<0.001
SocCapCog	1.166	<0.001
SocCapStr	1.331	<0.001
SocCapRel	1.163	<0.001

Table 8.17 VIFs and P-values for 2nd Order Measurement Model
Source: Author

All of the second orders' indicators loadings were significant; with a VIF not exceeding the threshold of 5 as well suggests good validity.

8.8. 1st Order Structural Model Results

Sections 8.6 and 8.7 focused on assessing the measurement model at first and second order levels. Having confirmed these measures as satisfactory, the next stage of the process is to assess the structural model (Hair et al., 2019).

The structural model in this research is formed of hypotheses related to the relationships between:

1. Social capital and sustainable development.
2. Cluster governance and social capital.
3. Cluster governance and sustainable development.

The structural model was assessed by using the techniques proposed by Hair et al*.,* (2014). The assessment is made up of four parts: coefficient of determination (R^2); cross-validated redundancy (Q^2); path coefficients; and the effect size (f^2).

8.8.1. Coefficient of determination (R^2)

The coefficient of determination, or R^2, refers to the measure of the model's predictive accuracy on scale from 0 to 1, with 1 representing complete predictive accuracy. Hair et al., (2014) propose as a rule of thumb R^2 values of 0.75, 0.50 and 0.25 showing substantial, moderate, or weak predictive accuracy respectively. It is acknowledged however the interpretation of R^2 does depend on the question being analysed, and that different disciplines interpret the effect of R^2 differently (Hair, Ringle and Sarstedt, 2011; Terstriep and Lüthje, 2018).

There is little consistency in cluster research on the acceptable values of R^2 to demonstrate predictive accuracy, with Garcia et al., (2018) suggesting R^2 >0.50 is strong; Sölvell, Ketels and Lindqvist, (2009) suggesting only that R^2 = 0.357 and R^2 = 0.3941 demonstrate a significant relationship; Long and Zhang (2011) refer only to R^2 values >0.7; Terstriep and Lüthje (2018) argue for R^2 >0.190 being significant, with the justification that factors outside the scope of their study also having an impact; and Budsaratragoon and Jitmaneeroj (2019) reporting significant results between 0.120 and 0.503.

Given this inconsistency, and recognition of some factors influencing sustainable development being outside the scope of this research, R^2 can be interpreted as follows: less than 0.200 are significant, but weak, >0.200 being significant and moderate, and above 0.300 as being moderate to strong in significance.

Whilst R^2 as a tool for measuring predictive accuracy is useful, it has some limitations, notably potential increase in R^2 if a correlated but non-significant construct is put into the model (Hair et al., 2014; Rose and McGuire, 2019). As a result, the adjusted R^2 can provide a more meaningful interpretation as it reduces R^2 when additional constructs are added (Hair et al., 2014).

Table 8.18 to Table 8.20 show the R^2 and adjusted values R^2 for the variables used in the study. The results demonstrate that the prediction of governance and social capital on sustainable development was generally moderate, resulting in a meaningful relationship; governance on social capital was relatively weak, and although minimal, still has/d a meaningful effect on cognitive aspects of social capital.

Relationships	R^2	Adjusted R^2
GovNorm ➔ SDPeople	0.327	0.286
GovNorm ➔ SDPlanet	0.354	0.315
GovNorm ➔ SDProfit	0.377	0.339
GovCog ➔ SDPeople	0.327	0.286
GovCog ➔ SDPlanet	0.354	0.315
GovCog ➔ SDProfit	0.377	0.339
GovPol ➔ SDPeople	0.327	0.286
GovPol ➔ SDPlanet	0.354	0.315
GovPol ➔ SDProfit	0.377	0.339

Table 8.18 R-Square Values for Governance/Sustainable Development Relationships
Source: Author

Relationships	R^2	Adjusted R^2
GovNorm ➔ SocCapRel	0.207	0.183
GovNorm ➔ SocCapStr	0.128	0.102
GovNorm ➔ SocCapCog	0.344	0.324
GovCog ➔ SocCapRel	0.207	0.183
GovCog ➔ SocCapStr	0.128	0.102
GovCog ➔ SocCapCog	0.344	0.324
GovPol ➔ SocCapRel	0.207	0.183
GovPol ➔ SocCapStr	0.128	0.102
GovPol ➔ SocCapCog	0.344	0.324

Table 8.19 R-Square Values for Governance/Social Capital Relationships
Source: Author

Relationships	R^2	Adjusted R^2
SocCapCog ➔ SDPeople	0.327	0.286
SocCapCog ➔ SDPlanet	0.354	0.315
SocCapCog ➔ SDProfit	0.377	0.339
SocCapRel ➔ SDPeople	0.327	0.286
SocCapRel ➔SDPlanet	0.354	0.315
SocCapRel ➔ SDProfit	0.377	0.339
SocCapStr ➔ SDPeople	0.327	0.286
SocCapStr ➔ SDPlanet	0.354	0.315
SocCapStr ➔ SDProfit	0.377	0.339

Table 8.20 R-Square Values for Social Capital/Sustainable Development Relationships
Source: Author

8.8.2. Cross-validated redundancy (Q^2)

Cross-validated redundancy provides a measure of the predictive relevance of the inner model. Q^2 is produced based on estimates calculated by parts of the data matrix being removed, followed by a prediction of the missing data. This prediction is compared to the original; the smaller the difference the greater the Q^2 and consequently the model's predictive accuracy (Hair et al., 2014). Whilst this measures whether the construct can be predicted, it does not indicate the quality of the prediction (Sarstedtet al., 2014). The Q^2 values for effects on the variables are shown in Table 8.21 and as all are over zero, they indicate predictive relevance.

Effects on:	Q^2
SDPeople	0.363
SDPlanet	0.344
SDProfit	0.418
SocCapRel	0.212
SocCapStr	0.136
SocCapCog	0.353

Table 8.21 Q2 Values
Source: Author

8.8.3. Path coefficients

Path coefficients represent the direct effect one variable has on another. This means that if the independent variable changes by one standard deviation, the dependent variable will change by β standard deviations, with β being the path coefficient. The β coefficient ranges from +1 to -1. Those closer to +1 suggest stronger relationships, whereas those closer to -1 suggest strong negative relationships (Hair et al., 2014). After confirming the significance of the relationships, attention must be placed on the strength of the structural coefficients.

Relationships	Path Coefficient	P Value	R^2	Interpretation
GovNorm SDPeople	0.38	<0.01	0.33	Positive, significant
GovNorm SDPlanet	0.03	0.39	0.35	Insignificant
GovNorm SDProfit	0.01	0.47	0.38	Insignificant
GovNorm SocCapRel	0.34	<0.01	0.21	Positive, significant
GovNorm SocCapStr	0.21	0.01	0.13	Positive, significant
GovNorm SocCapCog	0.42	<0.01	0.34	Positive, significant
GovCog SDPeople	0.34	<0.01	0.33	Positive, significant
GovCog SDPlanet	0.38	<0.01	0.35	Positive, significant
GovCog SDProfit	0.43	<0.01	0.38	Positive, significant
GovCog SocCapRel	0.21	0.01	0.21	Positive, significant
GovCog SocCapStr	0.14	0.07	0.13	Positive, significant
GovCog SocCapCog	0.23	<0.01	0.34	Positive, significant
GovPol SDPeople	0.04	0.33	0.33	Insignificant
GovPol SDPlanet	0.01	0.47	0.35	Insignificant
GovPol SDProfit	0.07	0.24	0.38	Insignificant
GovPol SocCapRel	0.06	0.25	0.21	Insignificant
GovPol SocCapStr	0.09	0.19	0.13	Insignificant
GovPol SocCapCog	-0.01	0.45	0.34	Insignificant

Table 8.22 Analysis of First Order Variable Relationships (Cluster Governance)
Source: Author

Relationships	Path Coefficient	P Value	R^2	Interpretation
SocCapCog SDPeople	0.29	<0.01	0.33	Positive, significant
SocCapCog SDPlanet	0.09	0.19	0.35	Not significant
SocCapCog SDProfit	0.18	0.03	0.38	Positive, significant
SocCapRel SDPeople	0.26	<0.01	0.33	Positive, significant
SocCapRel SDPlanet	0.29	<0.01	0.35	Positive, significant
SocCapRel SDProfit	-0.15	0.06	0.38	Not significant
SocCapStr SDPeople	0.19	0.02	0.33	Positive, significant
SocCapStr SDPlanet	0.14	0.06	0.35	Not significant
SocCapStr SDProfit	0.22	<0.01	0.38	Positive, significant

Table 8.23 Analysis of First Order Variable Relationships (Social Capital)
Source: Author

8.8.4. Effect size (f^2)

As they are independent of sample size, and offer a measure of significance in terms of the magnitude of the effect, effect sizes offer a useful tool to supplement null hypothesis significance testing (e.g., **p**-values) (Selya et al., 2012). Cohen (1988 pp. 9-10) argues that the phrase 'effect size' can be used to "*mean the degree to which the phenomenon is present in the population"*, without implying causality. The larger the effect size, the greater the degree to which the phenomenon being measured is demonstrated. Hair et al., (2014) suggest that, as a rule of thumb, 0.02, 0.15 and 0.35 represent small, medium and large effect sizes respectively. Whilst this is acceptable as a rule of thumb, the measure of effect size is relative; for example, Mueller and Jungwirth (2016) report that f^2 between 0.03 and 0.07 represent the strongest influence on cluster effectiveness.

Based on the data in Appendix K: Effect Sizes it can be seen that GovNorm has a positive, but relatively small effect on sustainable development, with a relatively higher effect on social capital. GovCog has a higher effect on both social capital and sustainable development. The least effect of the cluster governance variables was GovPol who had a positive, but relatively smaller effect on all social capital and sustainable development variables. SocCapCog, SocCapRel and SocCapStr had relatively higher effects on sustainable development variables.

8.9. 2nd Order Structural Model Results

The results show that cluster governance had a relatively strong positive effect on social capital within maritime cluster associations (β = 0.41 and significant at p<0.01). Although positive, social capital had a relatively weaker effect on sustainable development (β = 0.32 and significant at p<0.01), as did cluster governance on sustainable development (β = 0.34 and significant at p<0.01). These results are shown as Figure 8.5 and in Table 8.24.

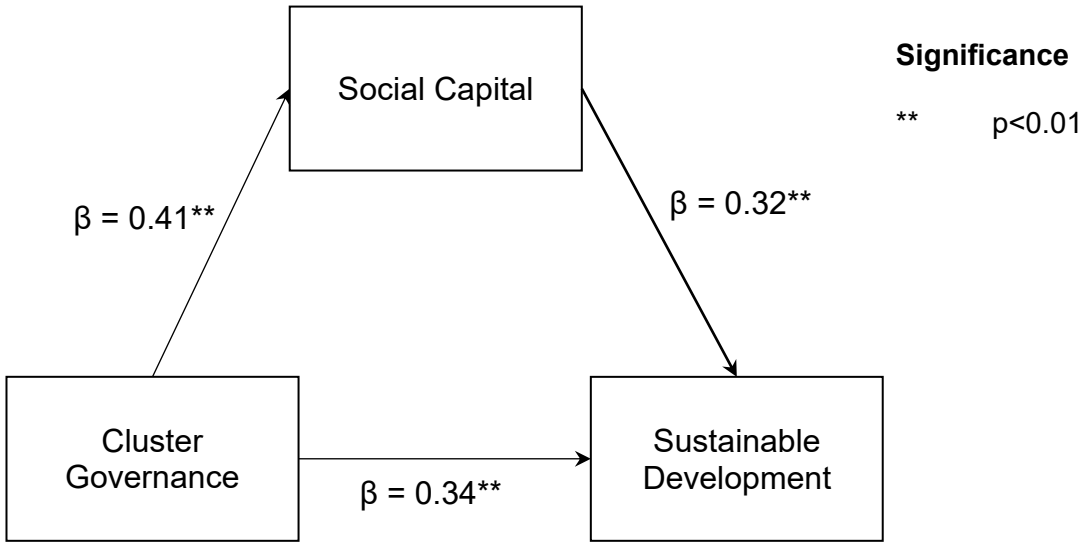

Figure 8.5 Relationship Model
Source: Author

Relationships	Path Coefficient	P Values	Effect Size	R^2	Q^2
Cluster Governance ➔ Social Capital	0.405	<0.001	0.164	0.16	0.168
Social Capital ➔ Sustainable Development	0.320	<0.001	0.143	0.30	0.303
Cluster Governance ➔ Sustainable Development	0.341	<0.001	0.157	0.30	0.303

Table 8.24 2nd Order Structural Model Results
Source: Author

Whilst a more extensive discussion of the results can be found in Chapter 9, this section aims to provide some discussion of the meaning of results in the context of the current literature.

Referring back to Figure 8.5 and Table 8.24 it is possible to see that all relationships tested were found to be significant and positive. The path coefficient refers to the effect of one variable on another; for example, with a path coefficient of 0.405, cluster governance has a positive direct effect on social capital and was the strongest of the three key relationships being tested in this research. As the cluster governance variable increases by one standard deviation, social capital will increase by 0.405 standard deviations. This means that social capital within the cluster will increase as perception of cluster governance increases.

The relationship between cluster governance and sustainable development had a path coefficient of 0.341, which means that as the positive perception of cluster governance increases by one standard deviation, so sustainable development will increase by 0.341 standard deviations. The literature indicates that clusters can have a positive effect on firm performance, whilst sustainable development

literature highlights a range of antecedents and drivers critical to enhanced sustainable development performance within both maritime firms (Yuen et al., 2017; Ashrafi et al., 2020; Tran et al., 2020) and non-maritime firms (Severo, Guimarães and Dorion, 2017; Dyck, Walker and Caza, 2019) that extends beyond the scope of clusters. This indicates that clusters can enhance sustainable development performance of firms, although other factors remain influential.

Whilst positive and significant, the relationship between social capital and sustainable development was found to be the weakest of the three, with a path coefficient of 0.320, meaning that as social capital increases by one standard deviation, sustainable development increases by 0.320 standard deviations. This is unsurprising and reflects the multi-faceted nature of social capital and the impact of other antecedents as described in the previous paragraph. Whilst this is the case, effects of social capital on sustainable development remain positive.

As for explained variance the findings show that 16% of social capital is explained by cluster governance. Whilst using the typical rule of thumb, the R^2 may be considered weak in terms of predictive power (Hair et al., 2019), there is little consistency in the cluster literature (see section 8.8.1), in the context of this research it is relatively weak, but significant. This may be explained by the possible unpredictability of relationships, and also related to the use of a single key informant in the data collection phase.

8.10. Direct and Indirect Effects: The Mediation Test

A mediating variable is one in the causal sequence between the independent and dependent variables which affects the relationship between the two (Baron and Kenny, 1986; MacKinnon, 2015). Mediation can be complete or partial; complete,

or full mediation occurs when the inclusion of the mediating variable causes a significant relationship between independent and dependent variables to become insignificant. If, on the other hand, the relationship remains significant with the inclusion of the mediating variable, the mediation is said to be partial (Kenny, 2018). There are a number of mediating effects found in the literature; these are shown in Table 8.25.

Type of Mediation Effects	Description
Direct-only nonmediation	The direct effect is significant but not the indirect effect
No-effect nonmediation	Neither the direct nor indirect effect are significant
Complementary mediation	The indirect effect and the direct effect both are significant and point in same direction
Competitive mediation	The indirect effect and the direct effect both are significant and point in opposite directions
Indirect-only mediation	The indirect effect is significant but not the direct effect

Table 8.25 Type of Mediation Effects
Source: Hair et al., (2017) p. 232

Hair et al., (2017) argue that strong *a priori* theoretical support is required in order to examine meaningful mediating effects, and that with that support, mediation can be a valuable analysis. Section 4.6 details the theoretical support for the mediating role of social capital, whilst the mediation model for this research is shown as Figure 8.6.

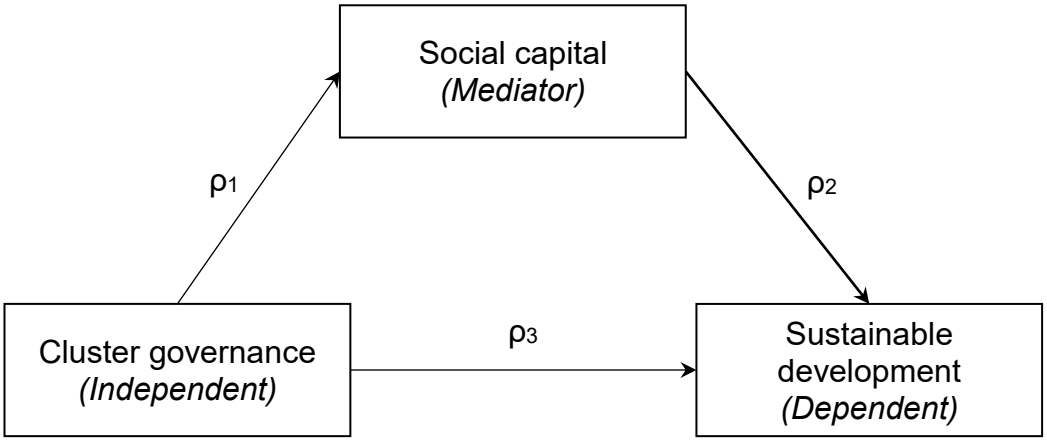

Figure 8.6 Mediation Model
Source: Author

Having established theoretical support for the mediating role of social capital, it is necessary to perform a series of analyses to confirm the type of mediation found in the model. These steps, together with their results, are shown in Figure 8.7.

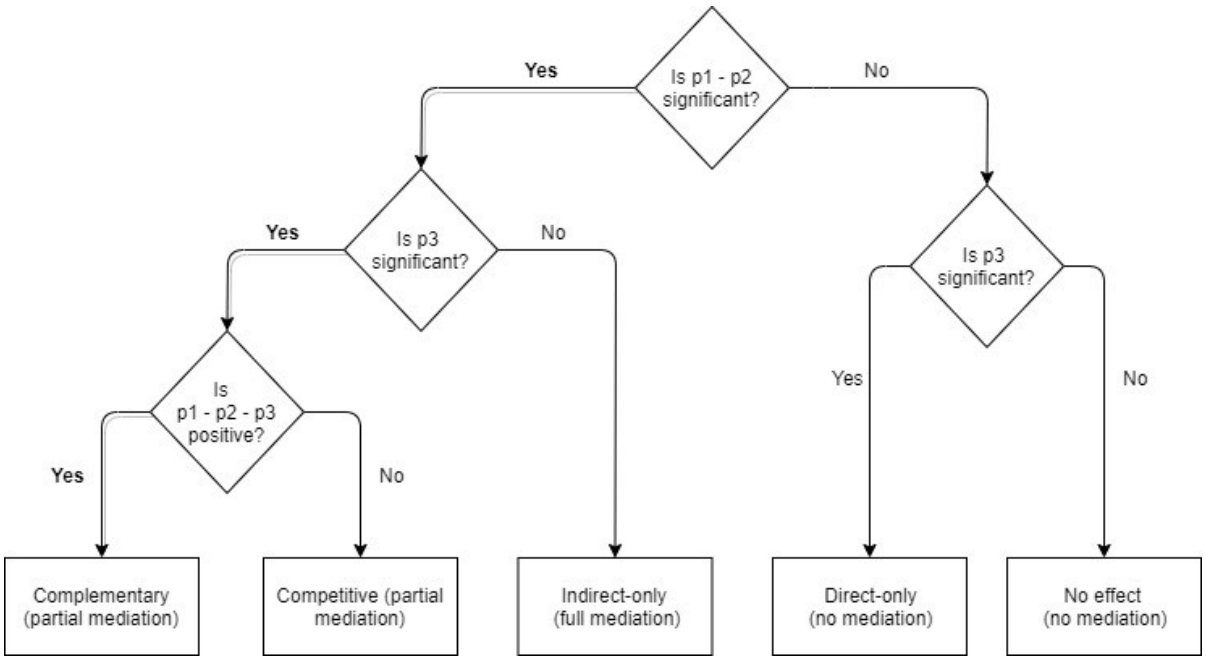

Figure 8.7 Mediation Analysis Procedure with Results
Source: Author, based on Hair et al., (2017) p. 233

Having established the presence of complementary mediation, the next stage is to determine the strength of the mediation. Variance Accounted For (VAF) is the measure of mediation; a VAF higher than 80% indicates full mediation, whilst a VAF between 20% and 80% demonstrates partial mediation. A VAF lower than 20% shows no mediation (Hair et al., 2014). VAF is calculated as follows:

$$vaf = \frac{(\rho_{12*}\ \rho_{23})}{(\rho_{12*}\ \rho_{23}) + \ \rho_{13}}$$

Based on the results shown in Figure 8.5, the results are calculated as follows:

$$vaf = \frac{(0.41 * 0.32)}{(0.41 * 0.32) + 0.34}$$

$$vaf = \frac{0.1312}{0.4712}$$

$$vaf = 0.2784$$

The VAF of 0.2784 demonstrates that a complementary (partial) mediation effect has taken place, with 27% of the effect of cluster governance on sustainable development being mediated through social capital.

8.11. Summary of PLS-SEM and Hypothesis Testing

Having shown the descriptive analysis of the data and summarising it in section 0, the next part presented the results from the PLS-SEM analysis. The validity of the measures was confirmed by testing internal consistency with Cronbach's alpha and composite reliability; convergent validity by measuring average variance extracted; and final discriminant validity with the square root of average variance extracted. Having confirmed the measurement model, the chapter showed the results of the 1st and 2nd order structural model.

The analysis techniques, namely R^2, Q^2, path coefficients and effect size, indicate that there is a significant and positive relationship between the variables in line with the theoretical framework and conceptual model. The following table presents results of the hypothesis testing.

Main Hypothesis	Supported?	Sub-hypotheses	Supported?
H1: A positive perception of cluster governance enhances sustainable development within maritime cluster associations	Yes	H1a: A positive perception of normative governance enhances sustainable development within maritime cluster associations	Yes
		H1b: A positive perception of cognitive governance enhances sustainable development within maritime cluster associations	Yes
		H1c: A positive perception of political governance enhances sustainable development within maritime cluster associations	No
H2: A positive perception of cluster governance enhances social capital within maritime cluster associations	Yes	H2a: A positive perception of normative governance enhances social capital within maritime cluster associations	Yes
		H2b: A positive perception of cognitive governance enhances social capital within maritime cluster associations	Yes
		H2c: A positive perception of political governance enhances social capital within maritime cluster associations	No
H3: Positive social capital enhances sustainable development within maritime cluster associations	Yes	H3a: Positive structural social capital enhances sustainable development within maritime cluster associations	Yes
		H3b: Positive relational social capital enhances sustainable development within maritime cluster associations	Yes
		H3c: Positive cognitive social capital enhances sustainable development within maritime cluster associations	Yes
H4: Social capital has a mediating effect on relationship between cluster governance and sustainable development within maritime cluster associations			Yes

Table 8.26 Results of Hypothesis Testing
Source: Author

The results demonstrate that social capital has a significant and positive effect on sustainable development within maritime cluster organisations, thus supporting hypothesis H3. The results also showed a significant and positive relationship between cluster governance and sustainable development, supporting hypothesis H2. The relationship between cluster governance and social capital was also positive and significant, supporting hypothesis H1. Furthermore, the VAF indicates that there is a mediating effect of social capital in the relationship between cluster governance and sustainable development, supporting hypothesis H4. Table 8.26 shows the results of the hypothesis testing. Having completed the PLS-SEM analysis, the next chapter discusses results and places them in the context of the literature.

Chapter 9. Discussion

9.1. Introduction

This chapter discusses the general findings of the research detailed in Chapter 8 in the context of the research questions and the way in which they fit the existing body of knowledge. The chapter starts by briefly reviewing the research gaps, questions and conceptual model.

9.2. Research Gaps, Research Questions and Conceptual Model

Despite the growing body of literature examining the role of cluster organisations across industry generally, and more specifically within the maritime context, there remains a gap in the literature about the impact of cluster governance on sustainable development and the intervening role of social capital in this relationship. Furthermore, there is a gap in the cluster governance literature relating to the perceived impact of governance, rather than the presence of governance alone.

In the specific context of maritime cluster organisations, the gap in governance literature is emphasised given the more heterogeneous mix of member firms. With such diverse interests represented within the broad maritime context, the role of governance in ensuring the strategic direction of the cluster is maintained takes on greater significance.

The aims of this study are twofold: the first was to confirm the nature of the relationship between the perceived governance of maritime cluster organisations, social capital and sustainable development; with the second being to develop a model of cluster governance that will enable maritime cluster managers to enhance the sustainable development of businesses within their organisations.

The research sought to achieve these aims using both interviews and questionnaires. The interviews were conducted to confirm the model of cluster governance, social capital and sustainable development to be used, with the quantitative phase research examining relationships between:

- Cluster governance and social capital.
- Social capital and sustainable development; and between
- Cluster governance and sustainable development.

The research also investigated the role of social capital as a mediating factor in the relationship between cluster governance and sustainable development. The conceptual model shown as Figure 9.1 was proposed in section 4.10.

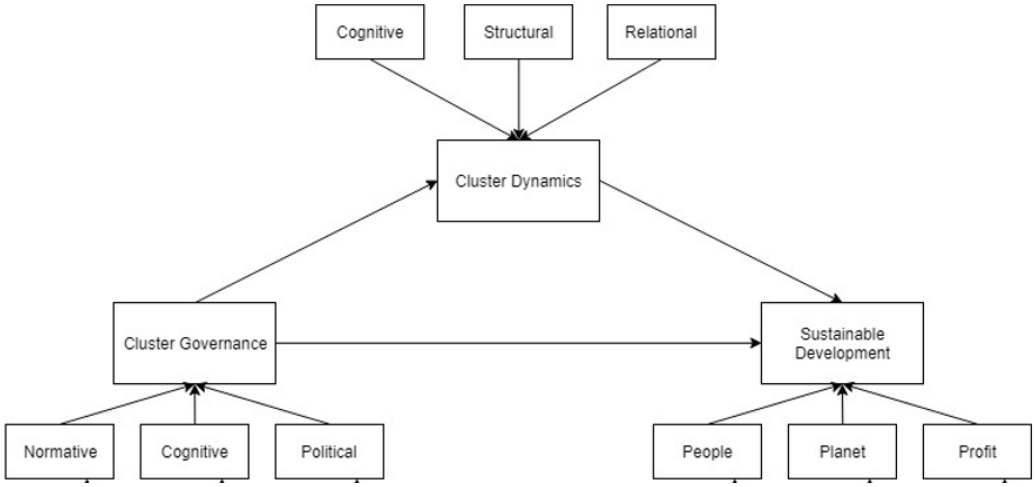

Figure 9.1 Final Conceptual Model
Source: Author

A set of research questions were developed to address the gaps in the literature; these were presented earlier in section 4.7, but shown again here to help frame the discussion chapter.

Number	Research Question
What are the dimensions and relationships of effective cluster governance and sustainability in maritime cluster associations?	
RQ1	What is the direct relationship between perceived cluster governance and sustainable development in maritime cluster associations?
RQ2	What is the direct relationship between perceived cluster governance and social capital in maritime cluster associations?
RQ3	What is the direct relationship between social capital and sustainable development in maritime cluster associations?
RQ4	Does social capital have a mediating effect on the relationship between cluster governance and sustainable development in maritime cluster associations?

Table 9.1 Research Questions
Source: Author

The relationship between the Research Questions and associated Hypotheses are shown in Table 9.2. The rest of the chapter is structured around the theoretical relationships derived from the Research Questions. Section 9.3 addresses the relationship between cluster governance and sustainable development. This is linked to RQ1 and the related hypotheses examining the three dimensions of cluster governance (H1a, H1b, and H1c). Section 9.4 examines the relationship between cluster governance and social capital, and is linked to RQ2 and hypotheses H2a, H2b and H2c. Section 9.5 considers the relationship between social capital and sustainable development (RQ3) and hypotheses H3a, H3b and H3c. The final part of the chapter, Section 9.6 examines the role of social capital as a mediating variable between cluster governance and sustainable development (RQ4 and H4).

Research Question	Main Hypothesis	Sub-hypotheses
RQ1: What is the direct relationship between perceived cluster governance and sustainable development in maritime cluster associations?	H1: A positive perception of cluster governance enhances sustainable development within maritime cluster associations	H1a: A positive perception of normative governance enhances sustainable development within maritime cluster associations H1b: A positive perception of cognitive governance enhances sustainable development within maritime cluster associations H1c: A positive perception of political governance enhances sustainable development within maritime cluster associations
RQ2: What is the direct relationship between perceived cluster governance and social capital in maritime cluster associations?	H2: A positive perception of cluster governance enhances social capital within maritime cluster associations	H2a: A positive perception of normative governance enhances social capital within maritime cluster associations H2b: A positive perception of cognitive governance enhances social capital within maritime cluster associations H2c: A positive perception of political governance enhances social capital within maritime cluster associations
RQ3: What is the direct relationship between social capital and sustainable development in maritime cluster associations?	H3: Positive social capital enhances sustainable development within maritime cluster associations	H3a: Positive structural social capital enhances sustainable development within maritime cluster associations H3b: Positive relational social capital enhances sustainable development within maritime cluster associations H3c: Positive cognitive social capital enhances sustainable development within maritime cluster associations
RQ4: Does social capital have a mediating effect on the relationship between cluster governance and sustainable development in maritime cluster associations?	H4: Social capital has a mediating effect on the relationship between cluster governance and sustainable development within maritime cluster associations	

Table 9.2 Relationship between Research Questions and Hypotheses
Source: Author

9.3. Cluster Governance and Sustainable Development

For the purposes of this research and based on a range of definitions drawn from the literature, cluster governance is defined as 'the strategic mechanisms by which the cluster operates and member firms work towards vitality.' Based on the literature a model of cluster governance was developed and tested through interviews during the preliminary qualitative phase. The model had three dimensions: normative, cognitive and political, with each dimension broken down further. This model was shown earlier in section 4.10.

Overall, there was a positive relationship between cluster governance and sustainable development, with the findings supporting hypothesis H1 that cluster governance has a positive effect on sustainable development in maritime cluster associations. This is in line with the literature arguing that clusters provide a business ecosystem in which common sustainable development goals can be identified and worked towards (Knauseder, 2009; Glinskiy et al., 2016; Srovnalíková, Havierniková and Guščinskienė, 2018). The emphasis on collaboration and identification of common issues with clusters are central to this.

At a dimensional level, the findings supported H1a and b, indicating that cognitive and normative governance positively and significantly influenced sustainable development. Only H1c, political governance, was rejected. Results shown in section 6.11 from the preliminary qualitative phase add further support to the significance of normative and cognitive governance. There was some discussion on political aspects, this was more limited, whilst normative and cognitive issues dominated.

9.3.1. Normative Governance

Normative governance relates to the strategic actions made to support the development and sustenance of relationships, trust, shared identity and collective goals of the cluster (Eisingerich, Bell and Tracey, 2010). The results indicate that normative governance had a positive effect on sustainable development. This is in line with elements of the cluster literature emphasising the development of both development of communities and collaborative projects (Storper and Venables, 2004; Viederyte, 2013; Lu, Shang and Lin, 2016; Wise, Wilson and Smith, 2017; Anić et al., 2019). Bringing interrelated and interconnected firms together in a way that supports the concept of co-opetition and shared value are therefore key roles of cluster managers. The results from this study which demonstrate the role of collaboration to achieve shared sustainable development goals are consistent with other research such as Berthinier-Poncet (2014) and Bixler et al. (2016). Wang et al. (2020) further argue that collaboration within the maritime industry plays a key role in the achievement of the United Nations Sustainable Development Goals (SDG). Trust and co-operation have been identified as strategic factors that influence competitiveness in maritime clusters (Stavroulakis et al., 2019), and whilst the study focused on competitiveness, there is a link between increased competitiveness and sustainable development (World Economic Forum, 2020).

Within the context of maritime clusters, there is evidence from the literature that supports the need for clear strategic direction to co-ordinate efforts in order to achieve long-term growth (Viederyte, 2013). This is supported by Othman, Bruce and Hamid (2011) who identified the need for effective cluster strategy in order to develop a competitive and sustainable maritime sector in Malaysia. A lack of

strategic focus can negatively impact the regional maritime economy; empirical work from Quebec highlighted the lack of an export-oriented strategic approach and structural shifts in the industry as having negative consequences for firm performance (Doloreux and Melançon, 2008). Furthermore, a lack of strategy implementation can ultimately hinder the financial and innovative performance of maritime businesses (Shimengah, Gathenya and Otieno, 2019). Both innovation and financial performance have been included in the sustainable business model used in this research. This reinforces the importance of clear cluster strategy development and implementation in order to achieve sustainable development goals.

Section 3.4.4 discussed the link between regional collaboration and sustainable development. It argued that collaboration can positively affect sustainable development through industrial symbiosis in two ways; the first is through resource use; with the second focusing on the knowledge exchange aspects of industrial symbiosis. Martin and Harris (2018) established empirical support for industrial symbiosis in the maritime context making a positive contribution to socio-economic and environmental impacts through the sharing of waste products and shared innovation. The vast majority of ship demolition and recycling takes place in four countries; India, Bangladesh, Pakistan, and Turkey (United Nations Conference on Trade and Development, 2019). Gregson et al. (2012) highlight the role of industrial symbiosis in the development of an agglomeration economy, which developed further into a secondary metal processing cluster, based around the shipbreaking yards of Sitakunda-Bhatiary in Chittagong, Bangladesh. The strategic need to find a suitable substitute for primary steel production has resulted in a successful cluster based on industrial

symbiosis. In turn this collaboration between firms has contributed to Bangladesh being the main country of demolition for the first time (United Nations Conference on Trade and Development, 2019).

9.3.2. Cognitive Governance

Cognitive governance refers to practices that support the creation and diffusion of knowledge amongst cluster members (Berthinier-Poncet, 2014). The results show that cognitive governance had the strongest effect on sustainable development in terms of governance. This is consistent with previous studies such as Masocha and Fatoki (2018) relating to mimicry; Morrissey, O'Donoghue and Hynes (2011) and Lombardi and Laybourn (2012) in terms of knowledge and support to meet sustainable development objectives.

Industrial symbiosis was discussed in the previous section as providing a means of enabling knowledge exchange. Knowledge is linked to increased sustainable development as a consequence of knowledge-sharing practices and spillovers leading to increases in productivity and innovation. It is argued that these practices contribute to the three categories: innovation; competitiveness and productivity; and environmental impact. These are summarised in Figure 9.2.

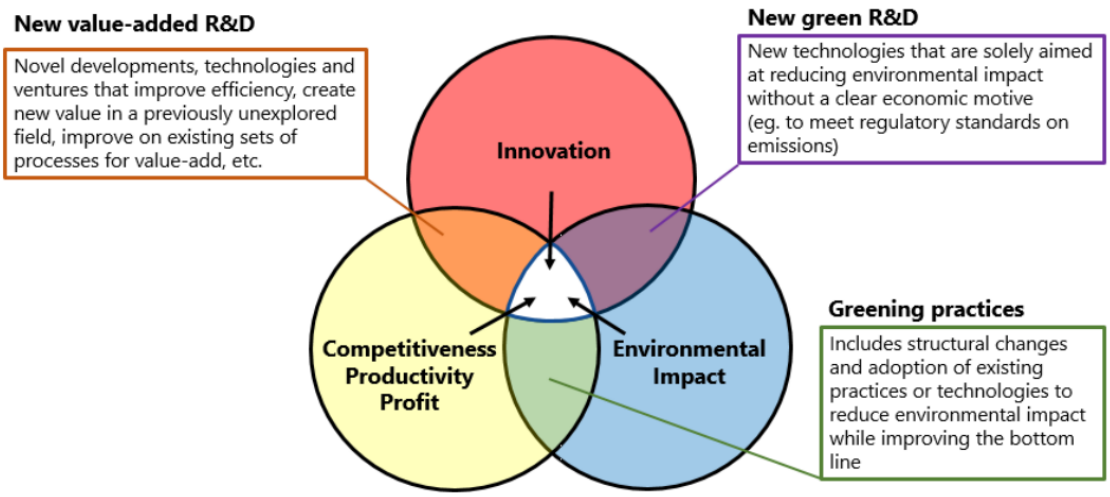

Figure 9.2 Key Spheres of Maritime Sustainable Development
Source: Hansen et al. (2018 p. 14)

Table 9.3 highlights the knowledge sharing facilitation role played by a sample of maritime clusters. It highlights the role played by clusters in bringing various organisations together to develop and use knowledge for product and service development.

Cluster	Example Sustainability Focus	Contribution
NCE Maritime CleanTech – Norway	Emission reduction from maritime activities	Support to R&D projects; enabling knowledge sharing practices
Nagasaki Marine Industry Cluster Promotion Association – Japan	Marine renewable energy	Collaborative learning practices to support marketization of innovation; knowledge sharing
Oceans Advance – Canada	Advanced offshore technology, e.g., ocean observation	Enabling knowledge sharing through relationships with R&D institutions
The Maritime Alliance – USA	Ecosystem development through skills	Enabling knowledge sharing through relationships with R&D institutions; market knowledge to drive innovation

Table 9.3 Cluster Facilitated Knowledge Sharing for Sustainable Development
Source: Author, based on Hansen et al. (2018)

9.3.3. Political Governance

The final dimension of cluster governance is political governance which refers to the operating framework around which the cluster is based, access to external resources, and branding (Berthinier-Poncet, 2014). The results showed that this had no effect on sustainable development, and therefore H1c is rejected.

This position appears to be somewhat contrary to the general cluster literature that suggests that clusters can be an enabler in member firms accessing external resources and that external support can contribute to sustainable development (Expósito-langa, Tomás-miquel and Molina-morales, 2015; Wise, Wilson and Smith, 2016; Anić et al., 2019; Speldekamp, Saka-Helmhout and Knoben, 2020).

In terms of external support, this position may be due to firms not being aware of this support being offered, not taken up or left unsupported by cluster members (Schmitz and Nadvi, 1999), although there was nothing identified from the empirical work to support this. Patterns of behaviour amongst different clusters and their institutional context may also account for this contrary position (Biggeri, 2017). Of the indicators of political governance, access to external support had the highest mean response, thus suggesting that there is recognition amongst member firms that clusters can provide access to external support. Access to external support was quite strongly supported during the preliminary qualitative phase. It may be that some maritime cluster organisations are perceived to have not been particularly successful in gaining external support for member firms, or in the promulgation of such success. Further empirical work on this point is required.

From the branding/identity perspective this finding appears contrary to previous studies which have highlighted the significance of branding and collective identity in both the development of the cluster (Zamparini and Lurati, 2012) and sustainability of the place (Maheshwari, Vandewalle and Bamber, 2011; Boesso, D'Orazio and Torresan, 2012).

This may be due to the perceived importance of place branding/identity in the maritime industry; literature has typically focused on tourism and heritage-related identity in the maritime context, e.g. Hudson (2011) or Alexandros et al., (2015), thus suggesting that in the global maritime industry, location branding may be perceived by firms as less important other than factors given geographical ties (Viederyte, 2013). Only quite recently has the non-heritage maritime industry attracted interest in place branding across the literature (Rutter et al., 2018;

Baştuğ, Şakar and Gülmez, 2020). Ianca and Batrinca (2010) argued that there was a general lack of branding/marketing of the Romanian maritime industry; likewise McKinley (2012) recommended development of place branding for South West UK maritime activity. Karlsen (2005) highlighted a key point relating to maritime cluster branding/marketing; some clusters rely heavily on a few firms rather than broader marketing. This over-reliance on a few firms may reduce focus on external activity. Furthermore, Robins (2012) suggested that, in the UK at least, many clusters have historically not identified themselves as clusters. This would have an impact on overall cluster branding/marketing. There is little in the literature since that examines branding/marketing in the maritime cluster context.

A further possible explanation for H1c being rejected may be found in the cluster lifecycle literature. Consideration was not given to the stage of the cluster lifecycle the cluster associations that were sampled during this research were in; typical focus at earlier stages of cluster development is often around developing relationships and collaboration (PWC, 2011; Polozhentseva and Klevtsova, 2015). The cluster branding and marketing literature does suggest that clusters in earlier stages often link themselves quite closely with the place in which they are located (Andersson, Solitander and Ekman, 2016). It is only in more developed stages that the clusters typically become separated a little from their place and become standalone entities. Given the greater regional significance, as opposed to sector significance, of maritime clusters, many sampled during this research included the name of the place in which they were located. This may reduce the impact of any cluster branding, although further empirical work is required to explain this.

In summary, cognitive governance was found to be the most important factor of governance affecting sustainable development, followed by normative, with a less significant focus on political governance.

The more positive emphasis on cognitive governance rather than other forms of governance could be related to the stage in the lifecycle of the clusters used in this research. Early activities in the development of clusters can often focus on the development of relationships, inter-firm support and knowledge sharing (PWC, 2011; Polozhentseva and Klevtsova, 2015).

9.4. Cluster Governance and Social Capital

The findings demonstrated that there was a positive and significant relationship between cluster governance and social capital, with the results supporting H2 that cluster governance enhances social capital.

At a dimensional level both H2a and H2b were supported, identifying a positive impact on social capital by normative and cognitive governance. These results are in line with previous studies examining clusters and social capital (Huber, 2009; Menzel and Fornahl, 2009; Smith and Brown, 2009; Crescenzi, Gagliardi and Percoco, 2013; Cáceres-Carrasco, Santos and Guzmán, 2019). Only H2c, political governance, was rejected.

The strongest relationships were between both cognitive and normative governance on cognitive social capital. This is perhaps unsurprising given the nature of both cognitive and normative governance, and the aspects of both shared and systems of meaning within cognitive social capital. Both also had an impact on relational social capital. These findings are in line with the literature (Menzel and Fornahl, 2009; Smith and Brown, 2009; Reid and Smith, 2012).

9.4.1. Cognitive Governance

Practices within networks that support the creation and diffusion of knowledge are defined as cognitive governance. (Berthinier-Poncet, 2014). Cognitive social capital refers to the shared representations and systems of meaning. This was argued to enable the creation and exchange of knowledge. Relational social capital is rooted in four dimensions: trust; norms; obligations and expectations; and (network) identification. There is support within the literature that both cognitive and relational social capital contributes to the diffusion of knowledge (Inkpen and Tsang, 2005; Parra-Requena, Molina-Morales and García-Villaverde, 2010; Steinmo and Rasmussen, 2018). Evidence from the maritime cluster literature suggests that communities with shared values, meanings, and norms facilitate collaboration and innovation (Pinto, Cruz and Combe, 2015), and so act to reinforce themselves.

9.4.2. Normative Governance

The development and maintenance of relationships, through factors such as trust, shared identity and collective goals form normative governance (Eisingerich, Bell and Tracey, 2010). Given the elements of trust and shared values form part of relational social capital, the results supporting the relationship between normative governance and relational social capital were anticipated. Relational social capital was characterised in the conceptual model as linkages within the cluster and region, the so-called “local buzz”, and further afield “global pipelines” (Bathelt, Malmberg and Maskell, 2004; Storper and Venables, 2004). Isaksen (2009) established empirical support for both local buzz and global pipelines being requirements for innovation within Norwegian clusters; Doloreux and Melançon (2008) found variation with respect to local buzz and global

pipelines across the Quebec coastal maritime industry that was dependent on firm size and research intensity. They also found that clustered firms did not co-operate more intensively than non-clustered firms. Although little in the way of explanation was provided for this, it may be due to the strategic focus of the cluster and clustered firms. As a then newly established cluster, the Irish Maritime and Energy Resource Cluster exhibited low levels of intra-cluster linkages, there was sufficient evidence demonstrating the potential for these to develop and contribute to strong intra-cluster relationships (Morrissey and Cummins, 2016). The UK Department for Transport (2019) highlighted the need to develop strong linkages to enhance innovation across UK maritime cluster associations.

9.4.3. Political Governance

There was an insignificant relationship between political governance and social capital. The indicators of political governance related to branding/identity, access to external support, and a membership strategy. As discussed in section 9.3 it may be that the supporting empirical evidence is from outside the maritime sector and that during the preliminary qualitative phase the interviewees benefitted disproportionally from external support, thus perceiving it more favourably. The discussion in the literature relating to social capital acting as a barrier may also be a factor in this: Wang et al., (2017 p. 654) argue that "*the positive features of social capital increase at a decreasing rate while the negative features intensify with accumulation*." This means that if maritime cluster associations are exhibiting (relatively) strong levels of social capital consequentially reducing the ability of other firms to enter into relationships, external actors may be unwilling or unable to invest (de Vaan, Frenken and Boschma, 2019). There is little evidence in the

maritime cluster imitative context to confirm or refute this, meaning that it is an area that requires further empirical enquiry to determine.

In terms of branding and identity, the results did not support the position adopted by Zamparini and Lurati (2012) who argued that branding/identity formed the collective soul of the cluster. These results may be linked to the discussion of branding/identity in the previous section and that location branding may be perceived by firms as less important other than factors (Viederyte, 2013; Rutter et al., 2018; Baştuğ, Şakar and Gülmez, 2020). The results may also contradict Zamparini and Lurati (2012) in the maritime cluster organisation context, suggesting instead that the collective identity of clustered firms may be less important than the communities and relationships that have been developed. Staber and Sautter (2011) argued that there were no reasons to believe that clusters could be seen as having a single identity. It could be that the sub-communities and shared projects take on personalities for themselves, rather than the cluster having a single identity. The preliminary qualitative phase of this research found that communities of interest had developed in some of the cluster associations, thus offering further support for this. The results may also show that the clusters did not have mature branding strategies as a result of their position in the cluster lifecycle (PWC, 2011; Polozhentseva and Klevtsova, 2015), or perceived value of collective identity. Whilst this is suggested, there is little empirical evidence to confirm or refute that position.

It could be argued that instead of clusters enabling access to external resources being a contributor to the development of social capital, there may be an inverse relationship whereby social capital, together with the cluster managers, enhance the ability of firms to access external resources. This would be consistent with the

literature linking social capital with the acquisition of external resources (Omri and Boujelbene, 2015).

In summary, the findings showed that cluster governance has a positive impact on social capital in maritime cluster associations, with normative governance being the strongest, followed by cognitive governance. Political governance had no effect on social capital.

9.5. Social Capital and Sustainable Development

Findings from examining the relationship between social capital and sustainable development supported hypothesis H3, establishing a positive relationship between social capital and sustainable development. This is consistent with the literature (Rydin and Holman, 2004; Tsai, 2008; Thuy et al., 2011; Kusakabe, 2012; Monteil, Simmons and Hicks, 2020).

At the dimensional level, all three hypotheses, H3a, H3b and H3c were supported. H3a indicated that structural social capital had a positive relationship with sustainable development (people and profit), but no significant relationship existed between structural social capital and the planet aspect. The strongest relationship was between structural social capital and profit, closely followed by the relationship with people.

H3b showed that relational social capital had a significant effect on sustainable development (people and planet), but no significant relationship existed between relational social capital and the profit aspect. The strongest relationship was between relational social capital and planet, followed by the relationship with people.

Finally, H3c confirmed that cognitive social capital, defined as factors such as shared meaning, language, codes, artefacts, representations and interpretations that facilitate the sharing of knowledge (Hunter, 2013), had a significant effect on sustainable development (people and profit), but no significant relationship existed between cognitive social capital and the planet aspect. The relationship between cognitive social capital and people was clearly the strongest, followed by the relationship with profit.

9.5.1. Cognitive Social Capital

Cognitive social capital, including factors such as shared meaning, language, and interpretations that facilitate the sharing of knowledge (Hunter, 2013) had the strongest relationship with the people dimension of sustainable development. Cognitive social capital is characterised by stakeholder engagement, people management systems, and skills development. In engaging with stakeholders, these findings are consistent with the literature (Milligan and O'Riordan, 2007; O'Riordan and Fairbrass, 2014; Omri and Boujelbene, 2015; Romero, Ruiz and Fernandez-Feijoo, 2018; Gulakov and Vanclay, 2019). Engagement with stakeholders is viewed as critical to the societal acceptance of port cluster activity and its future development (Dooms, Haezendonck and Verbeke, 2015; Lee et al., 2018). van Rijswijk et al. (2008) highlighted the importance of creating shared understandings in the development of user-driven innovation programmes across the Netherlands, including in the maritime context.

9.5.2. Relational Social Capital

Relational social capital is developed by the relationships that develop as a result of growing trust, respect and friendship between individuals and is reflected in the conceptual model as linkages within and outside the cluster. Relational social

capital had the greatest effect on the planet dimension of sustainable development which consists of environmental management and resource efficiency measures. This is consistent with the industrial symbiosis literature. Whilst earlier industrial symbiosis literature focused on the physical exchange of materials rather than knowledge exchange, it did contribute to the growing focus on geographically proximate firms. As the concept has evolved, there is now greater focus on the creation and diffusion of knowledge, and of enhanced innovation (Lombardi and Laybourn, 2012). There are two aspects to maritime cluster associations that link to industrial symbiosis; the first refers to the strategic model of symbiotic relationships that occur within such clusters (Zhang and Lam, 2013); with the second linked to the transfer of physical products and also knowledge (ElMassah, 2018). There is support for the application of industrial symbiosis in developing sustainable practices in the cluster context (Taddeo, Simboli and Morgante, 2012; Neves et al., 2020) but little in the literature that directly links industrial symbiosis with maritime clusters. One notable exception to this is the work of Gregson et al. (2012) who focused on symbiosis in ship recycling yards in Bangladesh; this work has been examined further and in different countries, confirming the link between relational social capital and sustainable development e.g. (Du et al., 2017; Hossain, 2018).

Trust is a dimension of relational social capital. It is argued that trust forms an important part of the relationships within maritime clusters. De Langen (2002) states that it contributes to a reduction in transaction costs; with a number of other authors highlighting trust as central to the development of business networks (Klinting, 2010; Laaksonen and Mäkinen, 2013; Tolvanen, Erkkilä-Välimäki and Nylén, 2019); the UK Department for Transport (2019) and the University of the

Aegean (2017) extend this further by arguing that trust is a fundamental aspect of maritime clusters. Further evidence from Australian maritime clusters has highlighted trust as being critical to innovation (Djoumessi, Chen and Cahoon, 2019). Within maritime clusters trust is typically developed through proximity, close working relationships and sustained reputation effects (de Langen, 2004). This enables further opportunities for collaboration as potential partners with strong reputations are more likely to be trusted. Regular cluster networking such as meetings and events can contribute to the development of trust (Mersey Maritime, 2018). There is argued to be a circular process linked to trust and sustainability; higher levels of trust within communities have been linked to increased sustainable development activity (Owen and Videras, 2008), with empirical evidence supporting the adoption of Corporate Social Responsibility and sustainability policies by maritime firms as antecedents of trust (Fasoulis and Kurt, 2019).

9.5.3. Structural Social Capital

Structural social capital can be viewed as a facilitator of knowledge exchange that influences the network (Nahapiet and Ghoshal, 1998) and characterised as the value placed on relationships in terms of intelligence, skills and product development. This had the strongest relationship with the profit dimension of sustainable development, which comprises aspects of economic development, strategic planning and organisational & management processes. These links are consistent with the economic development literature (Sachs, 2012). Innovation has been cited as a fundamental driver of long-term economic growth (European Central Bank, 2017), with the aspects of strategic planning and organisational & management processes being cited as antecedents of innovation (Ramos,

Figueiredo and Pereira-Guizzo, 2018). There is empirical support in the maritime cluster context supporting the relationship between the development of relationships and innovation which drives economic development (Pinto, Cruz and Combe, 2015).

Whilst relational social capital is characterised by trust, respect and friendship in the nurturing of relationships, so structural social capital contributes to the development of more tangible benefits from those relationships (Wasserman and Faust, 1994). Local buzz and global pipelines refer to linkages within the cluster and region, “local buzz”, and more widespread linkages as “global pipelines” (Bathelt, Malmberg and Maskell, 2004; Storper and Venables, 2004). This chapter has already established the positive link between such linkages in the maritime cluster context, and the perceived importance of developing these, e.g. see Morrissey and Cummins (2016) and Department for Transport (2019). Djoumessi, Chen and Cahoon (2019) established the role of competitors outside clusters, but within Australia and overseas as key sources of knowledge.

In summary, social capital has a positive effect on sustainable development in maritime cluster associations, with hypotheses H3, H3a, H3b, and H3c all supported. The findings are consistent with the literature.

9.6. The Mediating Role of Social Capital

Section 4.6 examined the mediating role of social capital in the relationship between cluster governance and sustainable development. It has been argued that social capital acts as a mediator in similar contexts (Capello and Faggian, 2005; Crescenzi, Gagliardi and Percoco, 2013; Harris, Wright and McMahan, 2019). The findings supported hypothesis H4 that social capital acts as a mediator in the relationship between cluster governance and sustainable

development. This is supported in the context of maritime clusters by Pinto, Cruz and Combe (2015 p. 170) who depict social capital as the "*missing ingredient*" which stimulates both resource acquisition and the development of shared values and trust. There are many other cases in the literature relating to maritime clusters that identify social capital as a key enabler without explicitly referring to it as a mediating factor (Doloreux and Melançon, 2008; Lazzeretti and Capone, 2009; Holte and Moen, 2010; Hammervoll, Halse and Engelseth, 2014; Makkonen and Inkinen, 2014; Pardali, Kounoupas and Lainos, 2016; Grillitsch, 2019). It is therefore unsurprising to identify social capital as a mediating factor in the relationship between cluster governance and sustainable development in maritime cluster associations.

Whilst there is a positive relationship between cluster governance and sustainable development, so there is a need for behaviours that drive social capital to be included in governance planning.

9.7. Summary

This chapter recalled the research gaps, research questions, conceptual model and hypotheses used in this research. After this the chapter briefly reviewed the main findings for each of the conceptualised relationships before discussing them in the context of the literature. Areas of agreement with the literature were identified as were areas where the findings of this study were not consistent with earlier research. Possible explanations were identified and justified. Overall, the findings supported the conceptualised relationships, demonstrating that cluster governance had the greatest effect on social capital; the weakest effect, albeit positive, was social capital on sustainable development, although social capital

was also found to be a mediating variable on the relationship between cluster governance and sustainable development.

The next and final chapter concludes this study with a brief overview of the findings drawn from this research and provides some concluding remarks that focus on the aim, objectives and research questions. The limitations of the study are addressed, together with potential future research. There is a section that discusses the implications of this research in terms of the effects on theory, policymakers, cluster managers and industry.

Chapter 10. Conclusion

This chapter concludes the thesis and relates the findings with the aim and objectives of the research. The limitations of the study are discussed before recommendations for future research are presented. The chapter concludes with the contributions and implications of the research are examined.

10.1. Main Conclusions

The aim of this research was in two parts:

- To confirm the nature of the relationship between the perceived governance of maritime cluster associations, social capital and sustainable development.
- To develop a model of cluster governance that will enable maritime cluster managers to enhance the sustainable development of businesses within their associations.

A set of five objectives were used to achieve this aim which are addressed in the following sections:

10.1.1. Identify the Critical Dimensions and Relationships of Cluster Governance within Maritime Cluster Associations.

The purpose of this objective was to identify and test the theoretical and empirical models of cluster governance within the context of maritime cluster associations in order to establish a model that could be applied to the maritime sector. This enabled any maritime-specific aspects to be included, reflecting any peculiarities of the sector. The preliminary qualitative phase tested the established models across three maritime cluster associations resulting in the development of the final conceptual model which included normative, cognitive and political

dimensions of cluster governance. The results largely confirmed the model derived from the literature making some amendments identified through the preliminary qualitative phase of the research.

10.1.2. Develop a Model of Sustainable Development Applicable to Maritime Cluster Associations.

Given the broad nature of sustainable development and the potential for different definitions based on differing perspectives, together with the heterogeneous nature of maritime cluster associations, the second objective sought to establish a model of sustainable development that could be applied. The research applied the triple bottom line approach to sustainable development, enabling key dimensions of business to be viewed through the lens of economic, environmental and social development, characterised in this research as the sustainability dimensions of profit, planet and people. The research adopted the business model approach in developing the model of sustainable development, with each of the indicators based around strategic and operational issues.

10.1.3. Examine the Effect of Cluster Governance on Social Capital and Sustainable Development in Maritime Cluster Associations.

Having developed the models of cluster governance and sustainable development, they were tested in nine maritime cluster associations, along with social capital. The results from the questionnaires demonstrated that cluster governance had a positive effect on sustainable development in maritime cluster associations. These results suggest that along with actual governance, a positive perception of governance is important in influencing sustainable development behaviours in clustered firms, and in the development of social capital among clustered firms. This confirms that whilst cluster governance may focus on

particular strategic outcomes, such as sustainable development, it also contributes to the maintenance of social capital.

10.1.4. Examine the Effect of Social Capital on Sustainable Development in Maritime Cluster Associations.

The fourth objective focused on the relationship between social capital and sustainable development; the theoretical framework suggested that social capital will have a positive impact of behaviours related to sustainable development. The results confirmed the theoretical relationship and associated hypotheses.

10.1.5. Examine whether Social Capital is a Mediating Factor in the Relationship between Cluster Governance and Sustainable Development in Maritime Cluster Associations.

Having established that there is a direct relationship between social capital and sustainable development, this objective sought to determine whether social capital also acted as a mediator in the relationship between cluster governance and sustainable development. The results confirmed that social capital acts as a mediator, meaning that whilst social capital has a direct impact on sustainable development, it also has an indirect effect.

10.2. Limitations and Future Research

Despite the theoretical and practical implications, this study has several limitations. The first concerns single source bias; only one person within each member firm was asked to complete the questionnaire. Whilst the instructions requested that it was completed by an individual with closest links to the maritime cluster organisation, there may be others within the firm that offer contradictory views. Moreover, only member firms were questioned thus reflecting the perceived effect of their respective maritime cluster organisation and not

necessarily reflecting actual output from the cluster. Whilst this is a limitation of this research, it does link back to the implications for cluster managers discussed earlier in the chapter.

Furthermore, the study did not include analysis of the results in respect of the cluster lifecycle stage the maritime cluster organisation was in; cluster management may behave differently, and have different strategic foci depending on the position of the cluster in the lifecycle. Future studies could incorporate more analysis of cluster lifecycles to address this.

Each of the dimensions that made up cluster governance, social capital and sustainable development were treated as having equal weight. This may be a limitation of this study but requires further research to establish whether they should be treated equally. In addition, the study focused on the relationship between cluster governance and social capital on sustainable development. It did not consider other factors that may influence sustainable development behaviours, such as pre-existing corporate or stakeholder demands on sustainable development. Future research should establish whether the attitudes of member firms towards sustainable development is a mediating factor in the relationship between cluster governance and sustainable development.

Whilst the sample size was sufficient to conduct a robust PLS-SEM analysis, a larger sample would most likely result in a superior dataset. A generally low response rate, combined with collection from multiple countries, meant that the quantitative data collection process took nine months; time constraints meant that more time could not be allocated to this. This, together with the volume of data collected not being sufficient to conduct comparisons between clusters meant that there was potentially reduced variation in the findings. As a result, whilst the

findings in the maritime cluster organisation context are consistent with the theoretical framework, only a general picture of maritime cluster associations emerges. There may be other geographical and cultural effects that were not able to be examined; further work testing these measures in more distinct geographical areas would yield information relating to such effects. Purposive sampling can result in findings that are not generalizable; selecting cluster associations from a range of countries was intended to provide some mitigation but combined with the relatively low response rate meant this was not possible.

The cross-sectional nature of the research meant that impacts were measured at one specific point in time. Whilst this provides evidence of the effectiveness of cluster governance in driving sustainable development behaviours, a longitudinal study would enable greater insight into the extent of the relationship, particularly feedback loops between the constructs, thus enabling a more accurate understanding to be developed. Other factors could also be controlled for, such as length of cluster membership, or regularity of engagement with the cluster/other clustered firms. Cassanego Júnior et al. (2019) offer support for the need to have more longitudinal studies.

The purpose of this research was to examine the issues in the context of maritime cluster associations, so future research could test the model in non-maritime sectors. This would contribute to further validating the findings to provide a more general model of cluster governance.

Further research is required to establish the potential for weighting the different dimensions of cluster governance, sustainable development and social capital. This study relied on all dimensions having the same weighting, but different weights may have significant impacts on the relationships.

A longitudinal study, linked to the cluster lifecycle could provide enhanced results demonstrating the relationship between cluster governance and sustainable development, and feedback loops between the constructs, over a sustained period. Finally, and linked to this latter point, a study explicitly comparing governance across several maritime cluster associations may help to increase generalizability and provide further evidence of the relationship between cluster governance and sustainable development.

10.3. Contribution to Knowledge

Through the development of measurable models of cluster governance, sustainable development, and social capital, this study focused on the relationships between each of the concepts. Having demonstrated that positive relationships exist between cluster governance and sustainable development, cluster governance and social capital, and social capital and sustainable development within maritime cluster associations, this research has produced a number of theoretical, methodological and managerial implications. The findings have significance for cluster practitioners and managers, clustered firms, regional development policymakers and the academic community. The following sections discuss the theoretical and practical implications of this work.

10.3.1. Theoretical Implications

This research contributes to the maritime cluster literature in several ways. The first is that this research provides an empirical study of maritime cluster associations which extends beyond the more widely researched areas of economic development and innovation. Whilst these are of importance to maritime business and regional development, contemporary maritime business

requires a broader focus on issues that extend into social and environmental dimensions.

The second implication refers to the contribution this research makes to the cluster governance literature, both in terms of the governance of maritime cluster associations, and also cluster governance more generally. The development of an empirically tested cluster governance model provides a response to the call from Cassanego Júnior et al. (2019) to develop cluster governance classification metrics. The literature examining the effects of cluster governance beyond economic issues, innovation and participation in governance is minimal, meaning that this study contributes to the development of metrics used to assess cluster governance. By including a more holistic view of sustainable development into the model, this study offers an analytical framework that adds a deeper understanding of the effects of cluster governance and social capital on sustainable business performance. In doing so, this research contributes to the role of cluster governance in regional development issues. This can be used in cluster research as a means of understanding member firms' perceptions of governance and enable cluster managers to address any deficiencies. It also enables alignment of cluster strategies to meet sustainable development needs. Further practical implications are discussed in the next section.

10.3.2. Practical Implications

The findings have practical implications for those engaged in maritime cluster organisation development, governance, operation, and also for member firms within the cluster.

The first part of this section focuses on the implications for policymakers.

10.3.2.1. Policymakers

Given growing emphasis on clusters in the maritime domain to deliver socio-economic and environmental benefits, an empirically tested model of the effect of relationships provides a useful methodology to drive policy development. Findings of this research will allow policymakers charged with designing and implementing maritime clusters to focus on key aspects of cluster governance, both from a structural and operational perspective.

There are many different cluster structures throughout the maritime industry; these differences can have significant effects on competition, co-operation, and relationships between firms. The first implication of this research is presented as:

> **I1: Consider the existing structure of the maritime economy and the role of any leading firms in co-ordination, together with the proposed co-ordination model.**

Industry classification, local knowledge and existing sector associations provide information on regional structures. Cluster mapping tools provide a means of doing this; further guidance is provided by Ketels (2017) and European Cluster Collaboration Platform (2021b). Support for the cluster organisation model can be found through the European Cluster Collaboration Platform (2021a) and The Competitiveness Institute (2021).

Cluster membership strategy is an important factor in cluster success. While operational aspects are included in section 10.3.2.2, policymakers must consider the existing economic composition of the region. Factors to be considered here include: sectoral diversity of firms in the region; extent of existing relationships; and geographical proximity between firms. This leads to the second implication:

I2: Cluster policy should take into account the existing regional composition of firms, as well as existing relationships.

The initial descriptive analysis showed that the strategic aim of the cluster can have consequences for policy outcomes. Those with clear strategic emphasis at cluster level on sustainable development exhibited the highest perceived impact on sustainable development within cluster firms. NCE Maritime CleanTech is a good example of clear focus on sustainable development at strategic level.

I3: Develop cluster policy with clear purpose and strategic aim(s) for the region.

Having established overall cluster aims, the cluster policy should take into account specific targets, such as employment growth, to meet those aims, and operational objectives to support day-to-day cluster work, such as networking events (PWC, 2011).

The resultant design will enable more efficient use of resources to achieve sustainable development and social capital outcomes.

The next section focuses on implications of this research for cluster managers.

10.3.2.2. Cluster Managers

Cluster managers have a multi-faceted role in the operation and overall success of the cluster organisation and cluster itself. They must enact cluster policy, provide strategic and operational direction, and ensure there is adequate engagement between member firms. The findings of this research provide empirical evidence to focus on particular behavioural aspects, and the development of strategic actions in order to achieve higher levels of social capital within their cluster organisation, and ultimately deliver the sustainability needs of

the maritime industry. These are focused in the cognitive, normative, and political dimensions of cluster governance.

Normative governance has strategic implications for cluster managers in terms of the approaches they adopt to develop and nurture relationships amongst member firms. Central to this is the development of trust, shared identity and collective goals across the particularly heterogeneous membership base typical of maritime cluster associations. The trust and shared identity elements of this can be cultivated through regular face-to-face meetings and member events. Whilst these are perhaps fundamental roles of cluster managers, the empirically supported relationship between this and sustainable development enables cluster managers to understand the wider implications of relationship development, and also to focus on sustainability issues that can further reinforce the impact. This leads to the fourth and fifth implications of this research:

I4: Ensure cluster identity is shared across the membership base.

Activities aimed at cluster promotion, such as conferences/exhibitions, and media commentary, can contribute to the development of a clear cluster identity (PWC, 2011)

I5: Facilitate the development of trust and relationships across the membership base.

Regular formal and informal meetings, smaller scale collaboration between members, sharing firm and cluster success in relation to sustainable development can contribute to the development of trust and relationships between cluster firms.

There was discussion in section 9.3.1 around the creation of communities and sub-groups within individual cluster associations. Whilst these contribute to the development of shared identity and collective goals, sub-cluster level identities may contribute to a reduced cluster identity. Keeping these groups networked and within the overall cluster identity is therefore a key task for cluster managers. This forms the sixth implication:

I6: Ensure sub-groups/communities stay connected with overall shared goals across the maritime cluster.

The Swedish Maritime Technology Forum provides a good example of this; innovation, skills development, and green vessel development are key strategic areas for the cluster. Three sub-groups within the cluster are focused on an open innovation platform, the link between industry and education, and the Celeste project focusing on future vessel development (Swedish Maritime Technology Forum, 2021).

Cognitive governance focuses on the creation and diffusion of knowledge amongst cluster members (Berthinier-Poncet, 2014). Given the role of knowledge in enhancing sustainable development demonstrated in this study, cluster managers have empirical support justifying the importance of cultivating knowledge-sharing practices in their maritime cluster associations. Figure 10.1 shows a number of different strategic approaches to knowledge sharing within maritime cluster associations; these are linked to good cognitive governance.

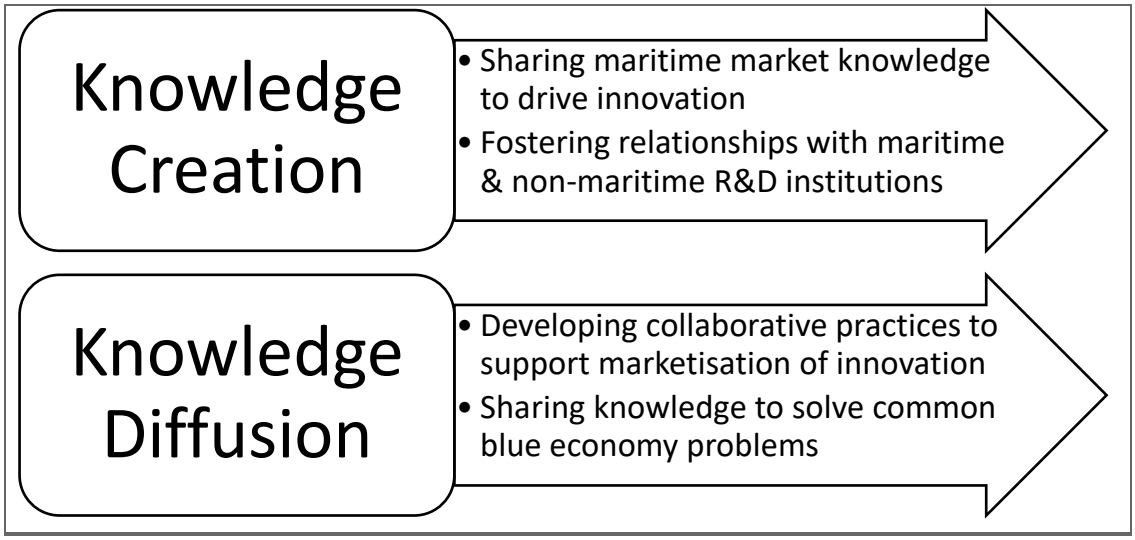

Figure 10.1 Cognitive Governance Processes for Knowledge Creation and Diffusion in Maritime Cluster Associations
Source: Author, based on Empirical Analysis

Within the context of maritime cluster associations and their particularly heterogeneous membership base, cluster managers must seek collaborative practices that can cut across industry sub-sectors in order to address common problems and drive innovation.

The Cornwall Marine Network in the UK has a community focused on renewable energy, with firms drawn from across business and engineering disciplines focused on the development of renewable sources of energy (Cornwall Marine Network, 2020). Failure to integrate into the overall cluster could lead to increased formation of sub-groups within the cluster that contribute to a reduction in shared identity across the cluster association.

There are two implications for cluster managers that emerge around knowledge creation and diffusion:

I7: Enhance knowledge-sharing practices amongst member firms with emphasis on implications for sustainable development related practices.

I8: Emphasise benefits of collaboration, e.g., to facilitate marketization of innovation and knowledge creation.

These implications are linked. I7 focuses more on practices to support knowledge-sharing, such as conferences and seminars. Examples drawn from the cluster associations used in this research include Maritime London (2021) and OceansAdvance (2018b). The Swedish Maritime Technology Forum (2021) host an open innovation platform (Project SARGASSO) which helps bring together firms for innovation and knowledge sharing projects.

All of the cluster associations in this study emphasised the benefits of collaboration through their web pages and communication to members. Examples were often shown where benefits were realised.

Political governance was not shown in the context of this study to have an effect on sustainable development, posing a number of potential implications for cluster managers. The first potential implication of this finding is that the importance of political governance is reduced, with greater effort focused on the normative and cognitive areas of governance. Given the theoretical relationship between political governance and sustainable development, and the activities that underpin political governance, this would seem to be an unwise move. Failure to attract external support, attract and retain members, and reduced attention on the activities linked to branding may well have greater negative consequences for the cluster as a whole. This may be of less significance in the nascent stages of cluster development but could become more critical in later stages of the cluster lifecycle.

Instead, the alternative view is that cluster managers should emphasise the role of external support in contributing to sustainable development, and that membership strategy is fundamental to the development of communities, shared identity and collective goals discussed earlier. The ninth and tenth implications of this research is focused on external support and membership strategy:

> **I9: Raise the profile of external support received as well as maintaining global pipelines, ensuring that the link to sustainable development activities is maintained.**

As part of their event programme NCE Maritime CleanTech holds events aimed at external support that is available to cluster members. A regular series of webinars focusing on business plan development, and the investment process are held. Events focusing on specific external support are also held, such as EU finance, and other project funding (NCE Maritime CleanTech, 2018b).

> **I10: Ensure clear membership strategy has been developed and communicated.**

An example membership strategy is shown as Appendix L.

This study focused on the perceptions of governance as a proxy for governance itself (Abbey, Tomlinson and Branston, 2016) meaning that cluster managers may have to focus on increasing the perceived value of activities linked to political governance. This leads to the eleventh implication of this research:

> **I11: Increase perceived value of activities linked to political governance.**

Efforts to achieve this can include: greater promotion of benefits and related cluster/firm successes; development of processes that are 'customer'-friendly that can increase engagement; and developing a positive reputation of the cluster management (Hansen, Samuelsen and Silseth, 2008; Hu, Kandampully and Juwaheer, 2009).

The final implication for cluster managers is linked to the mediating role of social capital. Social capital has been demonstrated to have a mediating role in the relationship between cluster governance and sustainable development. This finding is relevant to both cluster managers and member firms (implication for firms is discussed in section 10.3.2.3). Whilst social capital has a mediating effect it is important that cluster managers do not allow it to become a negative force, precluding external engagement as a result of excessive bonding social capital. Enhancing participation in externally-focused events can contribute to this, as can identification and promotion of external links; participative cluster leadership and greater engagement with governance can also contribute to this, as well as greater stakeholder engagement (Abbey, Tomlinson and Branston, 2016; Pillai et al., 2017; Martínez-Pérez et al., 2019). This is summarised as follows:

I12: Enhance external engagement to ensure shared values and strength of intra-cluster relationships do not reduce opportunities for firms within the cluster.

The next section considers the implications of this research for firms within the cluster.

10.3.2.3. Cluster Firms

Firms within clusters are not simply recipients of governance, they play a role in the adoption and success of strategies and associated actions. Implications for firms within clusters focus on social capital and is linked to the contribution social capital can make to sustainable development. This provides justification for member firms to continue their association and engagement with cluster organisations. This research has identified positive relationships between social capital developed within clusters and higher levels of sustainable development within firms. This has demonstrated that there are tangible benefits to membership of maritime cluster associations that exhibit good governance, providing firms with a clear rationale in sustainable development terms to engage with such cluster organisations.

Furthermore, there was discussion around measuring the return on the investment of time and money into cluster activities by member firms during the preliminary qualitative phase. Albeit not in direct financial terms, the positive effect of social capital on sustainable development demonstrates a positive return on investment to firms, further justifying membership. Whilst providing benefits to firms, cluster membership can contribute to overall economic, social and environmental development of the maritime industry in their region. Implications for firms within clusters are therefore:

I13: Engage with the cluster organisation to develop and implement shared vision and strategy for the cluster.

I14: Develop relationships with cluster management, and other firms in the cluster, to find areas of common interest and work towards shared goals/opportunities.

The final implication of this research is linked to the mediating role of social capital and was discussed in the context of cluster management in the previous section. Excessive social capital and cognitive proximity can become a negative force for development, precluding external engagement and inward investment. Member firms should be open to developing relationships with other firms within and outside the cluster (developing local buzz and global pipelines), and not seek to merely reinforce existing relationships.

I15: Engage with firms inside and outside the cluster association to develop opportunities for collaboration, innovation, and creation of knowledge.

Implications of this research have been discussed throughout this section and linked to appropriate stakeholders; Table 10.1 summarises the implications by stakeholder to enable easier comparison and highlight linkages.

Stakeholder	Action
Policymakers	I1: Consider the existing structure of the maritime economy and the role of any leading firms in co-ordination, together with the proposed co-ordination model.
	I2: Cluster policy should take into account the existing regional composition of firms, as well as existing relationships.
	I3: Develop cluster policy with clear purpose and strategic aim(s) for the region.
Cluster Managers	I4: Ensure cluster identity is shared across the membership base.
	I5: Facilitate the development of trust and relationships across the membership base.
	I6: Ensure sub-groups/communities stay connected with overall shared goals across the maritime cluster.
	I7: Enhance knowledge-sharing practices amongst member firms with emphasis on implications for sustainable development related practices.
	I8: Emphasise benefits of collaboration, e.g., to facilitate marketization of innovation and knowledge creation.
	I9: Raise the profile of external support received as well as maintaining global pipelines, ensuring that the link to sustainable development activities is maintained.
	I10: Ensure clear membership strategy has been developed and communicated.
	I11: Increase perceived value of activities linked to political governance.
	I12: Enhance external engagement to ensure shared values and strength of intra-cluster relationships do not reduce opportunities for firms within the cluster.
Cluster Firms	I13: Engage with the cluster organisation to develop and implement shared vision and strategy for the cluster.
	I14: Develop relationships with cluster management, and other firms in the cluster, to find areas of common interest and work towards shared goals/opportunities.
	I15: Engage with firms inside and outside the cluster association to develop opportunities for collaboration, innovation, and creation of knowledge.

Table 10.1 Implications for Cluster Stakeholders
Source: Author

The adoption of these within maritime cluster associations will contribute to maritime firms meeting sustainable development goals.

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Appendix A: Ethical Approval

Ref:

FoB/UPC/FREC/FREC1415.62
/clc Date: 14 August, 2015

Dear David

Ethical Approval Application No: FREC1415.62
Title: Examining the impact of social capital on Sustainable development in UK maritime cluster initiatives

The members of the Faculty Research Ethics Committee were in agreement that this was a well presented application which addressed all the relevant issues. In particular, potential research ethics were clearly identified and discussed to the extent to which they would be managed. However, we have the following suggestions for your consideration.
Section 10 (a): Informed Consent

Given that there was an implied indication in section 9 that interviews will be audio recorded, in addition to seeking consent for respondents' participation in the survey, informed consent should also be sought before interviews are audio recorded. Indeed, this was indicated in the attached document, "Consent for Participation in Interview Research." An indication of this in the application form would also have been useful.
Section 10 (c): Right to Withdraw

It would be more practical to limit the time period for withdrawing to avoid any potential adverse effects on research outcomes. Often the start of the analysis period could be considered an appropriate cut-off time for withdrawal.
Approval is for the duration of the project. However, please resubmit your application to the committee if the information provided in the form alters or is likely to alter significantly.

We would like to wish you good luck with your research project.

Yours sincerely

(Sent as email attachment)

Dr James Benhin
Chair
Faculty Research Ethics Committee
Faculty of Business

Appendix B: Consent for Participation in Interview Research

I volunteer to participate in a research project conducted by David Adkins, a PhD student with Plymouth University. I understand that the project is designed to explore Sustainable development perceptions and practices, together with the development of social capital in maritime cluster initiatives. I understand that the findings will be used to develop a quantitative model.

1. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, no one in my organisation or cluster will be told.

2. I understand that most interviewees will find the discussion interesting and thought-provoking. If, however, I feel uncomfortable in any way during the interview session, I have the right to end the interview or to decline to answer any question.

3. Participation involves being interviewed by a researcher from Plymouth University. The interview will last approximately 50-60 minutes. Notes will be written during the interview. An audio recording of the interview and subsequent transcript will be made. If I don't want to be taped, I will not be able to participate in the study.

4. I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

5. I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

6. I have been given a copy of this consent form.

_____ _____

My Signature Date

_____ _____

My Printed Name Signature of the Investigator

For further information, please contact: David Adkins at david.adkins@plymouth.ac.uk, telephone: 01752 585821

Appendix C: Initial Questionnaire

Questions to cluster firms:

A. Company information

1. Company name
2. Type of activities: services
3.
4. Years involved in the cluster

B. Economic data

1. Number of employees
2. Revenue
3. Profits (EBITDA) as % of revenue
4. R&D as % of revenue
5. Exports as % of revenue

SOCIAL CAPITAL

C. Perceived value of collaborative strength

As a representative of your company, please state to what extent you agree or disagree with the following statements:

Statement	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree
We identify ourselves as part of cluster					
We feel we are part of a collaborative effort					
In our experience, other members of cluster are open and willing to exchange information (about e.g. suppliers, clients)					
In our experience, other members of cluster are open and willing to exchange experience/expertise in order to tackle common issues					
When our company has a challenge that cannot be resolved in isolation, our company usually first turns to someone in cluster to help us find a solution					
We share a common view with other members of challenges and strategic objectives of cluster					

Working with others provides long-term benefits to our company…..					
for market intelligence					
for skills and workforce development					
for product/technology development					
for access to new markets					
to influence region/ policy/ regional innovation system					
to build reputation of sector					

D. Collaborative dynamics

Our company has contact with new partners about possible cooperation		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
Other Companies	Inside cluster					
	Outside cluster, in region					
	Outside cluster, beyond region					
Institutions (including research, training, design, etc.)	Inside cluster					
	Outside cluster, in region					
	Outside cluster, beyond region					

Our company seeks to engage in lower-risk project cooperation with new partners on common challenges (e.g. skills development, infrastructure, trade missions)		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
Other Companies	Inside cluster					
	Outside cluster, in the region					
	Outside cluster, beyond the region					
Institutions (including research, training, design, etc.)	Inside the cluster					
	Outside the cluster, in the region					
	Outside the cluster, beyond the region					

Our company seeks commercial cooperation with new partners (e.g. new supplier relationship, trading)		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
Other Companies	Inside the cluster					
	Outside the cluster, in the region					
	Outside the cluster, beyond the region					
Institutions (including research, training, design, etc.)	Inside the cluster					
	Outside cluster, in the region					
	Outside the cluster, beyond the region					

Our company seeks higher-risk project collaboration with new partners (e.g. strategic issues around innovation, addressing a joint challenge or opportunity)		Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
Other Companies	Inside the cluster					
	Outside the cluster, in the region					
	Outside the cluster, beyond the region					
Institutions (including research, training, design, etc.)	Inside the cluster					
	Outside cluster, in the region					
	Outside the cluster, beyond the region					

10. Engagement in collaborative activities

Our company has participated in collaborative activities/projects to:	None	Plan to engage next year	Once	Occasionally	Extensively
10.1 Improve market intelligence and strategic focus					
10.2 Attract or develop talent					
10.3 Attract investment					
10.4 Develop knowledge/research					
10.5 Foster innovation					
10.6 Support internationalisation					

For “yes” responses above:

I. Perceived return on investment of collaborative activities for company *(responses indicate companies’ perception of results)*

perceived value of collaborative activities for our company:	None	Low	Don’t yet know	High	Very High
11.1 Improve market intelligence and strategic focus					
11.2 Attract or develop talent					
11.3 Attract investment					
11.4 Develop knowledge/research					
11.5 Foster innovation					
11.6 Support internationalisation					

12. Please describe an example of how being a part of collaborative activities in the cluster has provided added value to your company.

CLUSTER GOVERNANCE

Organisation's perception of cluster governance (*responses indicate the views of the governance of the cluster that are held by the member organisations)*

As a representative of your company, please assess to what extent you agree with following statements:	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree
Normative					
The cluster promotes a clear identity with which we associate ourselves (Identity)					
There is a shared and explicit strategy for the cluster and their activities that is shared amongst members (Strategy)					
There are communities within the cluster that focus on shared goals (Communities)					
The cluster organisation actively encourages linkages between organisations across network (Network Linkages)					
The cluster organisation facilitates collaborative projects amongst members (Collaboration)					
There is clear emphasis on members being drawn from the local region (Geographical Proximity)					
Cognitive					
The cluster organisation encourages sharing of best organisational behaviours (Mimicry)					

The cluster organisation identifies regional training needs (Enhancing Absorptive Capacities)					
The cluster organisation facilitates skills development (Enhancing Absorptive Capacities)					
The cluster organisation encourages sharing of knowledge (Knowledge Management)					
The cluster organisation facilitates the effective sharing of knowledge. (Knowledge Management)					
The cluster organisation enables member organisations to support each other (Internal Support)					
Political					
The cluster organisation provides clear branding for maritime sector in region (Branding)					
The cluster organisation facilitates access to external support (External Support)					
The cluster organisation has a clear strategy for managing membership					
The cluster organisation provides a means to resolve conflict among member organisations (Conflict Resolution)					

SUSTAINABLE DEVELOPMENT

Organisation's perception of sustainable development - Being a member of the cluster can influence your organisational approach to different aspects of the business. As a representative of your company, please assess to what extent you agree or disagree with the following statements.

Statement	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree
We actively seek to use environmental knowledge to support what we are trying to do (Environmental Knowledge and Awareness)					
We have an accredited environmental management system in place to manage environmental impacts of our operations (Environmental Management)					
We proactively engage with our stakeholders and are able to influence stakeholder's perceptions. (Stakeholder Engagement)					
We participate in projects to benefit local community (Stakeholder Engagement)					
Our business practices are efficient and cost effective (Business Planning and Management)					
We seek out ways to be innovative in our products and business processes. (Innovation)					

We have achieved management system accreditation which reflects needs of our people and organisation (Effectiveness of Management Processes)					
Our organisational processes are able to adapt to change e.g. legislation, industry, processes (Change Management)					
Our strategic planning reflects our capacity to adopt sustainability in the long term. (Strategic Planning for Future)					
Our organisation is committed to talent management and continued learning (Education & Skills)					
As a result of our engagement with the cluster, we believe that we are more competitive and sustainable (Competitiveness)					

Appendix D: Outcomes of Pilot Study First Stage

Question Number	Issue Raised	How Rectified
1.3	Respondents may want to say yes to the exchange of information, but not expertise.	Split question into 2 parts
Social Capital	Too many questions asking for too much information	Reduced the number of questions to ensure focus
Respondent Profile	Use ranges for questions such as membership, turnover and exports.	Range, e.g., 2-5 years, 6-9 years added
General Points	Risk of method bias caused by only including positive questions	Negatively worded questions included
	What if a responder is a member of a number of clusters – are they able to highlight which cluster they are referring to in each question?	The questionnaire was directed to specific cluster organisations; respondents were asked to relate their answers to that specific cluster organisation.
	I think questionnaire is too long,	Questionnaire restructured to reduce number of questions
	Use 7-point Likert scale	Considered, and decided that 5-point scale was sufficient for this research

Appendix E: Final Questionnaire

CLUSTER GOVERNANCE

Cluster governance relates to the coordination of members' interrelations and has the potential to be a key determinant of innovation and co-operation, through strategic planning and the use of practical management tools at strategic as well as an operational level. There are three parts to cluster governance; normative, cognitive and political (Berthinier-Poncet, 2014). Normative relates to the development of identity and is linked to co-operation between members; cognitive relates to the creation and sharing of knowledge; political relates to the facilitation of members' relations.

Please answer all questions

As a representative of your company, please assess to what extent you agree with the following statements:	Dis-agree	Some-what disagree	Neither agree nor dis-agree	Some-what agree	Agree
There are communities within the cluster that focus on shared goals					
The cluster management organisation facilitates collaborative projects amongst members					
There is no clear emphasis on members being drawn from the local region					
There is an explicit strategy for the cluster and their activities that is shared amongst members.					
The cluster management organisation facilitates skills development					
The cluster management organisation facilitates the sharing of knowledge					
The cluster management organisation enables member firms to support each other					
The cluster management organisation encourages the sharing of best organisational practices					
There is no clear branding for the maritime sector in the region					
The cluster management organisation facilitates access to external support					
The cluster management organisation does not provide a means to resolve conflict among member firms					
The cluster management organisation has a clear strategy for attracting and developing membership					

SUSTAINABLE DEVELOPMENT

Sustainable business models incorporate a triple bottom line approach and consider a wide range of stakeholder interests, including environment and society. They are important in driving and implementing corporate innovation for Sustainable development, can help embed Sustainable development into business purpose and processes, and serve as a key driver of competitive advantage (Bocken et al., 2014 p.42)

Please answer all questions

As a representative of your company, please indicate to what extent you believe belonging to the cluster has had on the following: (1 being the lowest, 5 being the highest. Please score 1 for any that do not apply to your organisation)	1	2	3	4	5
We actively seek to use environmental knowledge to support what we are trying to do					
We have, or are working towards having, an environmental management system in place to manage the environmental impacts of our operations					
Our organisation strives to maximize material productivity and energy efficiency					
Our organisation seeks to create value from waste					
Our organisation tries to substitute non-renewable sources with renewable sources and natural processes					
We proactively engage with our stakeholders					
We are better able to influence our stakeholder's perceptions					
We participate in projects to benefit the local community					
We have achieved management system accreditation which reflects the needs of our people and the organisation					
Our organisation is committed to talent management and continued learning					
Belonging to the cluster has had a positive effect on our annual turnover					
Our strategic planning reflects our capacity to adopt Sustainable development in the long term.					
Our organisational processes are responsive to change e.g. coming from legislation or industry					
We are able seek out ways to be innovative in our products and business processes.					
Our business practices are efficient and cost effective					

SOCIAL CAPITAL

It has been argued that social capital, established through the development of relationships, shared norms and values, is a core part of the cluster. Social capital is linked to the relationships that exist within the cluster, usually in terms of their value and impact.

As a representative of your company, please state to what extent you agree or disagree with the following statements:	Strongly Disagree	Disagree	Neither agree / disagree	Agree	Strongly Agree
We identify ourselves as part of the cluster					
We feel we are part of a collaborative effort					
In our experience, other members of the cluster are open and willing to exchange information (about e.g. suppliers, clients)					
In our experience, other members of the cluster are reluctant to exchange experience/expertise in order to tackle common issues					
When our company has a challenge that cannot be resolved in isolation, our company usually first turns to someone in the cluster to help us find a solution					
We share a common view with other members of the strategic objectives of the cluster					

Working with others provides long-term benefits to our company…..	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
for market intelligence					
for skills and workforce development					
for product/technology development					
for access to new markets					
to influence regional policy					
to build the reputation of the sector					

When our company makes contact with others about possible co-operation, we look to companies and other organisations:	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
Inside the cluster					
Outside the cluster, in the region					
Outside the region					

When our company receives contact from others about possible co-operation, this contact is from companies and other organisations:	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
Inside the cluster					
Outside the cluster, in the region					
Outside the region					

RESPONDENT PROFILE

5. Which of the following best describes your position within your organisation?

   Administrative, Operational, Supervisor, Manager, Managing Director, CEO, Owner

6. Select one of the following that best describes the sector of the marine/maritime industry to which your organisation belongs.
   Seagoing shipping, shipbuilding, marine equipment, technical services, financial services, investors, ports, fishing, dredging, inland shipping, yachting, research institute, education provider, other

7. How long has your organisation been a member of the cluster?
   <1 year 2-5 years 6-9 years >10 years

8. How many employees does your organisation have?
   1-9 10-49 50-249 >250

9. What was your latest recorded turnover?
   ≤£1.7m ≤£8.7m ≤£43.7m >£43.8m

10. What is your R&D expenditure as a % of revenue?

    0-9% 10-19% 20-29% 30-39% 40-49% 50-59%
    60-69% 70-79% 80-89% 90-100%

11. What were your latest recorded exports as a % of revenue?

    0-9% 10-19% 20-29% 30-39% 40-49% 50-59%
    60-69% 70-79% 80-89% 90-100%

12. Would you like to receive the result of this study?
    Yes No
    If yes, please enter your email address.

Appendix F: Introductory Letter for the Questionnaire

MARITIME BUSINESS WITH PLYMOUTH UNIVERSITY

Date

Address

PhD RESEARCH – [CLUSTER NAME]

I am a PhD student at Plymouth University and given your organisation's membership of [CLUSTER NAME], I am writing to request your participation in my survey. My research is examining relationships, governance and sustainable development in geographic networks in the maritime sector.

I understand that you have many demands on your time, but I would appreciate it if you would complete the enclosed survey as your participation is crucial to the success of my research project, and to my overall PhD studies. The survey should take no longer than 10 minutes to complete, requiring you simply to tick boxes to mark your response. If you are able to complete the survey, could I ask that you return it to me in the enclosed postage paid envelope.

All participants' responses are anonymised, with only analysed results made available. If you include your email or postal address on the survey I will contact you with the major findings.

Appendix G: Initial Indicator Loadings

	GovNorm	GovCog	GovPol	SDPlanet	SDPeople	SDProfit	SocCap Cog	SocCap Str	SocCap Rel	P-value
CGN1	(0.853)	0.169	-0.129	-0.037	-0.114	0.048	-0.044	0.015	0.139	<0.001
CGN2	(0.845)	0.068	-0.111	-0.082	-0.025	0.152	0.038	-0.036	0.018	<0.001
CGN3	(0.289)	-0.222	0.295	0.126	-0.012	-0.02	-0.184	-0.174	0.105	<0.001
CGN4	(0.740)	-0.186	0.159	0.087	0.165	-0.221	0.079	0.092	-0.222	<0.001
CGC1	-0.122	(0.714)	-0.275	0.136	-0.193	-0.237	-0.093	-0.141	0.303	<0.001
CGC2	0.211	(0.836)	0.094	-0.254	0.159	0.123	0.043	0.04	-0.124	<0.001
CGC3	-0.054	(0.857)	0.039	0.212	-0.098	-0.052	0.065	0.174	-0.095	<0.001
CGC4	-0.053	(0.826)	0.103	-0.08	0.107	0.134	-0.03	-0.1	-0.037	<0.001
CGP1	0.321	-0.453	(0.698)	0.096	0.111	-0.117	-0.325	0.2	-0.182	<0.001
CGP2	-0.303	0.463	(0.731)	-0.034	-0.074	0.029	0.147	-0.144	0.235	<0.001
CGP3	-0.049	0.07	(0.350)	0.264	-0.093	0.135	-0.197	-0.133	-0.104	<0.001
CGP4	0.018	-0.057	(0.804)	-0.168	0.011	0.017	0.234	0.014	-0.011	<0.001

Initial Cluster Governance Indicator Loadings
Source: Author

	GovNorm	GovCog	GovPol	SDPlanet	SDPeople	SDProfit	SocCap Cog	SocCap Str	SocCap Rel	P-value
SDPL1	-0.242	0.212	-0.082	(0.778)	0.068	-0.105	0.326	-0.062	0.102	<0.001
SDPL2	-0.09	-0.263	0.016	(0.799)	0.024	0.255	0.148	-0.04	-0.051	<0.001
SDPL3	-0.083	0.314	0.024	(0.751)	0.11	0.107	-0.245	-0.055	0.121	<0.001
SDPL4	0.799	-0.556	-0.18	(0.317)	-0.184	-0.137	-0.248	0.384	-0.437	<0.001
SDPL5	0.081	-0.017	0.104	(0.863)	-0.112	-0.184	-0.127	0	0.011	<0.001
SDPE1	-0.01	-0.195	0.088	-0.29	(0.902)	-0.046	0.109	-0.031	-0.108	<0.001
SDPE2	-0.058	-0.039	0.064	-0.332	(0.853)	-0.082	0.023	0.013	-0.063	<0.001
SDPE3	0.05	0.081	0.021	0.308	(0.792)	-0.185	0.073	-0.038	0.128	<0.001
SDPE4	0.011	-0.132	-0.138	0.262	(0.733)	-0.064	0.021	0.11	-0.057	<0.001
SDPE5	0.018	0.404	-0.084	0.182	(0.599)	0.508	-0.319	-0.057	0.153	<0.001
SDPR1	-0.465	0.087	0.412	-0.198	0.092	(0.442)	0.572	0.058	0.127	<0.001
SDPR2	-0.297	0.089	0.19	0.159	0.17	(0.838)	-0.075	-0.09	0.038	<0.001
SDPR3	0.142	-0.24	0.013	-0.184	-0.338	(0.444)	0.033	-0.023	-0.058	<0.001
SDPR4	0.385	-0.113	-0.179	0.199	-0.192	(0.830)	-0.255	0.084	-0.065	<0.001
SDPR5	0.089	0.108	-0.245	-0.16	0.156	(0.810)	0.008	-0.012	-0.01	<0.001

Initial Sustainable Development Indicator Loadings
Source: Author

	GovNorm	GovCog	GovPol	SDPlanet	SDPeople	SDProfit	SocCap Cog	SocCap Str	SocCap Rel	P-value
SCC1	-0.232	0.219	-0.155	0.006	0.113	-0.238	(0.808)	-0.067	0.224	<0.001
SCC2	0.224	-0.087	-0.044	-0.047	0.015	0.06	(0.855)	0.056	-0.021	<0.001
SCC3	0.177	0.033	-0.053	-0.056	0.084	-0.159	(0.756)	0.108	-0.145	<0.001
SCC4	0.207	0.061	-0.043	0.02	-0.227	0.195	(0.266)	-0.154	-0.103	0.002
SCC5	-0.482	0.448	-0.026	0.259	-0.339	0.054	(0.458)	-0.188	0.229	<0.001
SCC6	0.042	-0.531	0.345	-0.071	0.073	0.282	(0.657)	0.078	-0.2	<0.001
SCS1	0.02	0.036	-0.093	0.009	-0.004	0.142	0.095	(0.805)	-0.031	<0.001
SCS2	-0.192	0.5	-0.178	0.117	-0.105	-0.048	-0.288	(0.749)	0.228	<0.001
SCS3	-0.087	0.105	0.02	-0.088	0.108	0.076	-0.143	(0.818)	0.038	<0.001
SCS4	-0.067	-0.172	0.186	-0.169	-0.028	-0.003	-0.016	(0.803)	0.002	<0.001
SCS5	0.107	-0.257	0.064	0.133	-0.022	-0.204	0.335	(0.731)	-0.199	<0.001
SCS6	0.218	-0.203	-0.006	0.018	0.039	0.014	0.03	(0.801)	-0.042	<0.001
SCR1	-0.018	0.308	-0.041	0.028	-0.574	0.275	0.151	-0.017	(0.565)	<0.001
SCR2	0.032	0.191	-0.186	0.345	-0.158	-0.094	-0.171	-0.126	(0.747)	<0.001
SCR3	-0.089	0.044	-0.128	0.196	0.093	-0.092	-0.174	0.16	(0.616)	<0.001
SCR4	-0.345	-0.097	0.481	-0.118	-0.313	0.308	0.298	-0.041	(0.586)	<0.001
SCR5	0.141	-0.127	-0.021	-0.117	0.177	-0.091	0.037	0.038	(0.876)	<0.001
SCR6	0.151	-0.218	-0.028	-0.278	0.516	-0.162	-0.072	-0.006	(0.800)	<0.001

Initial Social Capital Indicator Loadings
Source: Author

Appendix H: Indicator Loadings Post-Review

Indicator	GovNorm	GovCog	GovPol	SDPlanet	SDPeople	SDProfit	SocCapCog	SocCapStr	SocCap Rel	P-value
CGN1	(0.865)	0.108	-0.099	-0.002	-0.158	0.075	-0.06	-0.005	0.145	<0.001
CGN2	(0.856)	0.036	-0.098	-0.069	-0.044	0.161	0.02	-0.05	0.033	<0.001
CGN4	(0.739)	-0.169	0.229	0.082	0.236	-0.274	0.048	0.063	-0.208	<0.001
CGC1	-0.153	(0.714)	-0.234	0.126	-0.198	-0.215	-0.084	-0.149	0.317	<0.001
CGC2	0.196	(0.836)	0.119	-0.249	0.117	0.189	0.032	0.029	-0.12	<0.001
CGC3	-0.032	(0.857)	0.006	0.21	-0.077	-0.089	0.067	0.182	-0.102	<0.001
CGC4	-0.033	(0.826)	0.074	-0.075	0.133	0.086	-0.03	-0.09	-0.047	<0.001
CGP1	0.369	-0.4	(0.655)	0.159	0.184	-0.251	-0.38	0.221	-0.209	<0.001
CGP2	-0.307	0.402	(0.783)	0.033	-0.142	0.114	0.103	-0.156	0.198	<0.001
CGP4	-0.002	-0.064	(0.833)	-0.156	-0.011	0.091	0.202	-0.027	-0.022	<0.001

Cluster Governance Indicator Loadings Post-Review
Source: Author

Indicator	GovNorm	GovCog	GovPol	SDPlanet	SDPeople	SDProfit	SocCapCog	SocCapStr	SocCap Rel	P-value
SDPL1	-0.166	0.146	-0.091	(0.792)	0.022	-0.08	0.303	-0.025	0.061	<0.001
SDPL2	-0.03	-0.27	-0.036	(0.793)	0.053	0.21	0.155	-0.019	-0.086	<0.001
SDPL3	0.042	0.179	0.032	(0.778)	0.004	0.156	-0.299	0.004	0.062	<0.001
SDPL5	0.144	-0.048	0.089	(0.852)	-0.074	-0.264	-0.152	0.037	-0.033	<0.001
SDPE1	-0.02	-0.201	0.104	-0.304	(0.902)	0.026	0.107	-0.055	-0.092	<0.001
SDPE2	-0.089	-0.022	0.078	-0.308	(0.853)	-0.102	0.02	0.016	-0.06	<0.001
SDPE3	0.081	0.102	-0.028	0.307	(0.792)	-0.232	0.065	-0.023	0.122	<0.001
SDPE4	0.02	-0.132	-0.129	0.244	(0.733)	-0.105	0.031	0.106	-0.06	<0.001
SDPE5	0.026	0.363	-0.071	0.193	(0.599)	0.541	-0.313	-0.039	0.136	<0.001
SDPR1	-0.526	0.149	0.379	-0.297	0.059	(0.457)	0.602	0.01	0.144	<0.001
SDPR2	-0.256	0.051	0.183	0.159	0.123	(0.851)	-0.085	-0.078	0.01	<0.001
SDPR4	0.412	-0.177	-0.164	0.164	-0.246	(0.844)	-0.24	0.079	-0.072	<0.001
SDPR5	0.136	0.047	-0.233	-0.169	0.093	(0.817)	0	-0.006	-0.017	<0.001

Sustainable Development Indicator Loadings Post-Review
Source: Author

Indicator	GovNorm	GovCog	GovPol	SDPlanet	SDPeople	SDProfit	SocCapCog	SocCapStr	SocCap Rel	P-value
SCC1	-0.182	0.232	-0.204	-0.002	0.104	-0.247	(0.829)	-0.079	0.218	<0.001
SCC2	0.233	-0.082	-0.037	-0.029	0	0.05	(0.863)	0.044	-0.032	<0.001
SCC3	0.169	0.038	-0.014	-0.018	0.095	-0.203	(0.742)	0.116	-0.159	<0.001
SCC5	-0.483	0.459	-0.045	0.256	-0.379	0.093	(0.460)	-0.178	0.207	<0.001
SCC6	0.07	-0.551	0.355	-0.118	0.027	0.413	(0.654)	0.036	-0.199	<0.001
SCS1	0.075	-0.027	-0.083	0.024	-0.066	0.206	0.096	(0.805)	-0.041	<0.001
SCS2	-0.194	0.478	-0.164	0.122	-0.122	-0.03	-0.291	(0.749)	0.231	<0.001
SCS3	-0.053	0.094	-0.022	-0.072	0.077	0.089	-0.139	(0.818)	0.035	<0.001
SCS4	-0.103	-0.125	0.172	-0.175	0.003	-0.035	-0.01	(0.803)	0.006	<0.001
SCS5	0.07	-0.219	0.075	0.1	0.021	-0.217	0.337	(0.731)	-0.19	<0.001
SCS6	0.199	-0.19	0.018	0.02	0.079	-0.036	0.021	(0.801)	-0.043	<0.001
SCR1	-0.036	0.266	-0.003	-0.007	-0.662	0.444	0.131	-0.028	(0.565)	<0.001
SCR2	0.055	0.162	-0.189	0.388	-0.16	-0.143	-0.172	-0.09	(0.747)	<0.001
SCR3	-0.098	0.046	-0.093	0.273	0.174	-0.282	-0.182	0.21	(0.616)	<0.001
SCR4	-0.307	-0.059	0.385	-0.159	-0.346	0.381	0.298	-0.053	(0.587)	<0.001
SCR5	0.132	-0.12	-0.019	-0.142	0.17	-0.051	0.042	0.013	(0.876)	<0.001
SCR6	0.13	-0.201	-0.011	-0.295	0.551	-0.185	-0.056	-0.033	(0.800)	<0.001

Social Capital Indicator Loadings Post-Review
Source: Author

Appendix I: Discriminant Validity: Square Roots of AVEs

	GovNorm	GovCog	GovPol	SDPlanet	SDPeople	SDProfit	SocCap Cog	SocCap Str	SocCap Rel
GovNorm	(0.822)								
GovCog	0.625	(0.810)							
GovPol	0.581	0.551	(0.761)						
SDPlanet	0.288	0.439	0.181	(0.804)					
SDPeople	0.376	0.411	0.194	0.726	(0.783)				
SDProfit	0.343	0.527	0.2	0.661	0.718	(0.760)			
SocCapCog	0.542	0.489	0.363	0.366	0.38	0.409	(0.724)		
SocCapStr	0.245	0.284	0.199	0.266	0.391	0.412	0.377	(0.785)	
SocCapRel	0.136	-0.119	0.094	0.1	0.188	0.029	0.137	0.375	(0.708)

Source: Author

This table demonstrates that the square root of each construct’s AVE is higher than its highest correlation with any other construct.

Appendix J: Second Order Indicator Loadings

	ClustGov	SustDev	SocCap	P-value
GovNorm	(0.867)	-0.044	0.121	<0.001
GovCog	(0.854)	0.277	-0.172	<0.001
GovPol	(0.831)	-0.239	0.051	<0.001
SDPlanet	-0.017	(0.888)	-0.077	<0.001
SDPeople	-0.042	(0.912)	0.092	<0.001
SDProfit	0.06	(0.885)	-0.018	<0.001
SocCapCog	0.43	0.094	(0.674)	<0.001
SocCapStr	-0.099	0.098	(0.836)	<0.001
SocCapRel	-0.309	-0.217	(0.671)	<0.001

Source: Author

Appendix K: Effect Sizes

Relationships	Effect Size
GovNorm – SDPeople	0.004
GovNorm - SDPlanet	0.008
GovNorm - SDProfit	0.004
GovNorm - SocCapRel	0.117
GovNorm - SocCapStr	0.068
GovNorm - SocCapCog	0.233
GovCog - SDPeople	0.149
GovCog - SDPlanet	0.168
GovCog - SDProfit	0.232
GovCog - SocCapRel	0.081
GovCog - SocCapStr	0.040
GovCog - SocCapCog	0.115
GovPol - SDPeople	0.012
GovPol - SDPlanet	0.001
GovPol - SDProfit	0.017
GovPol - SocCapRel	0.009
GovPol - SocCapStr	0.020
GovPol - SocCapCog	0.005
SocCapCog - SDPeople	0.046
SocCapCog - SDPlanet	0.059
SocCapCog - SDProfit	0.074
SocCapRel - SDPeople	0.065
SocCapRel - SDPlanet	0.073
SocCapRel - SDProfit	0.035
SocCapStr - SDPeople	0.074
SocCapStr - SDPlanet	0.045
SocCapStr - SDProfit	0.093

Source: Author

Appendix L: Criterion for Membership in NCE Maritime CleanTech

Medlemskriterium (*Membership Criterion)*

1. Bransje: Verksemder som ønsker medlemskap i klynga må ønska å utvikla og kommersialisera løysingar som omhandlar reduksjon av miljø- og klimautslepp til maritim sektor og øvrige havnæringar. Maritim sektor er definert som: «Alle virksomheter som eier, opererer, designer, bygger, leverer utstyr eller spesialiserte tjenester til alle typer skip og andre flytende enheter» (kilde: Maritimt Forum). Klynga har si hovudtyngde i den maritime sektoren, men er tett integrert med offshoresektoren, fornybar energi og marin sektor.

1. Industry: Businesses that want membership in the cluster must want to develop and commercialize solutions such as the reduction of environmental and climate emissions to the maritime sector and other maritime industries. Maritime sector is defined as: "All enterprises that own, operate, design, build, supply equipment orspecialized services for all types of ships and other floating units" (source: Maritime Forum). Cluster has its main focus in the maritime sector, but is closely integrated with the offshore sector, renewable energy and marine sector.

2. Norsk senter for ekspertise: Maritime CleanTech er ei norsk klynge med verksemder som er internasjonalt leiande på utvikling av miljøteknologi relatert til maritim sektor og relaterte havnæringar. Medlemsverksemder skal bidra med kompetanse som kan forsterka klynga si utvikling.

2. *Norwegian Center for Expertise: Maritime CleanTech is a Norwegian cluster with companies that are international leaders in the development of environmental technology related to the maritime sector and related maritime industries. Membership activities must contribute with expertise that can strengthen the cluster's development.*

3. "Five stakeholders" God klyngedynamikk føreset tett samhandling mellom privat og offentleg sektor, FoU- og utdanningsinstitusjonar, kapitalmiljø og entreprenørskapsmiljø. FoU-miljø som kan levera kompetanse innan klynga sitt verkeområde kan takast opp som medlemmer. Fylkeskommunane, vertskapskommunar og det offentlege verkemiddelapparatet representerer offentleg sektor i klynga. Bank- og finansmiljø, venture- og kapitalfond og ulike investeringsmiljø, representerer den fjerde interessegruppa, medan inkubatorar, nyskapingsparkar er den femte interessegruppa.

3. *"Five stakeholders" Good cluster dynamics lead to close interaction between the private and public sector, R&D and educational institutions, capital environment and entrepreneurship environment. R&D environment that can deliver competence before the cluster's area of activity can be taken up as members. The county municipalities, host municipalities and the public policy instruments represent the public sector in the cluster. The banking and financial environment, venture and private equity funds and various investment*

environments represent the fourth interest group, while incubators, innovation parks are the fifth interest group.

4. Konkurrerande verksemder: Verksemder som konkurrerer med eksisterande medlemmer i klynga kan søka medlemskap. Det er forventa at verksemder ser moglegheiter for samarbeid med konkurrentar. Dette kan vera oppbygging av kompetansemiljø og ressursgrupper innanfor klynga, profilering av klynga, deltaking i felles FoU-prosjekt og påverking av rammevilkår for klynga sine verksemder.

4*. Competitive operations: Businesses that compete with existing members of the cluster can apply for membership. It is expected for companies to see opportunities for collaboration with competitors. This can be building a competence environment and resource groups within the cluster, profiling the cluster, participating in joint R&D project and influence of framework conditions for the cluster's operations.*

5. Oppstartsbedrifter: For å søka medlemskap må verksemda vera registrert i Brønnøysundregistra. Nystarta selskap kan i sitt første driftsår søka gratis medlemskap i klynga.

5. *Start-up companies: To apply for membership, the business must be registered in the Brønnøysund Register Center. Start-up companies can in its first year of operation apply for free membership in the cluster.*

6. Verdigrunnlag: Nye medlemmer må slutta seg til verdigrunnlaget til Maritime CleanTech: Engasjement, nytenking, tillit, openheit og samarbeidsvilje!

6. *Values: New members must join the values of Maritime CleanTech: Commitment, innovation, trust, openness and willingness to cooperate!*

Source: NCE Maritime CleanTech (2019)