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STAKEHOLDER MANAGEMENT IN MARITIME LOGISTICS ECOSYSTEMS

How tackling the main challenges of the industry

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ABSTRACT

This PhD thesis deals with stakeholder management theoretical constructs and empirical practices within maritime logistics ecosystems. The rationale of the study grounds on the recent shift of the academic literature's focus on maritime logistics from the single organisation to the whole business ecosystem. In this perspective, formal and informal relationships with business partners and related parties have been demonstrated to become fundamental for the survival and success of firms and organisations belonging to maritime logistics ecosystems. The constant dialogue and coordination of strategic and operational activities between the heterogeneous actors constitute the preconditions to build wider and more resilient networks as well as to generate benefits for all parties and stakeholders involved. In this context, stakeholder management theoretical constructs can provide maritime logistics firms and organisations with useful managerial practices and best practices for identifying and exploiting unprecedented opportunities to handle relationships and interactions with both business parties and different categories of stakeholders.

The variety of actors belonging to maritime logistics ecosystems as well as the array of related stakeholders, that unveils heterogeneous needs and interests, urge further empirical research to disentangle multiple practices of stakeholder management that have not all been investigated yet. In this vein, collaborative and responsible behaviours from maritime logistics firms and other involved organizations may support key actors with facing the new environmental, social, and technological challenges shaping the industry.

In this perspective, this PhD thesis examines the main theoretical constructs of stakeholder management by performing an extensive literature review to comprehend the foundations and managerial benefits of stakeholder relationship management and corporate social responsibility. Then, it provides four empirical research to disentangle both strategies and behaviours of different maritime logistics actors, stressing the business benefits and managerial opportunities emerging from the adoption of well-defined and planned stakeholder management practices.

Each empirical research addresses multiple challenges (i.e., environmental, social, and technological challenges) and assumes the perspective of one of the key actors of the maritime logistics ecosystem (i.e., once port managing bodies, once shipping companies, and twice terminal operators). The thesis investigates specific dimensions related to the strategic objectives, behaviours, and managerial options of these actors for effectively managing the relationships with their salient stakeholders.

The outcomes of empirical research provide four valuable exploratory and qualitative studies grounding on stakeholder management literature. Managerial implications for private, public and

hybrid actors of maritime logistics are extensively debated to pave the way for future studies on stakeholder management within this business ecosystem. In this perspective, this PhD thesis would take a step forward in the research on new managerial practices to effectively manage stakeholder relationships in the maritime logistics ecosystem.

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CHAPTER 1

INTRODUCTION TO THE PHD THESIS

1. Introduction to the PhD thesis

1.1. Background of research

1.1.1. The research domain

Academic literature on maritime logistics has recently shifted the focus of research from the single organisation to the whole business ecosystem (De Langen, 2002; Dooms and Verbeke, 2007; Zhang and Lam, 2013; Panayides and Song, 2013; Dooms et al., 2013; Pinto at al., 2015; Doloreux, 2017; Palmieri et al., 2019). To understand this assumption, first, it is important to define what is a business ecosystem and why it so crucial for the growth and survival of actors of maritime logistics. One of the most comprehensive definition is provided by Moore (1993) who argues that a business ecosystem is a network of organizations which work cooperatively and competitively to develop new products, meet customers' expectations, and innovate the business. In line with the concept of "biological ecosystem", a business ecosystem consists of a community (i.e., organisms), including suppliers, distributors, customers, competitors, government agencies, and other public and private organisations, and non-living components related to the overall competitive environment (e.g., information and communication technologies, digital or transport infrastructure, etc.). Each actor of the ecosystem affects and is affected by the others, creating constantly evolving relationships that result in a dynamic environment, requiring companies to develop specific capabilities of managerial adaptation and transformation to preserve their competitive position and survive in the industry (Moore, 1993).

According to this definition, stakeholder management theoretical constructs and empirical practices can develop and strengthen the competitive position of organizations embedded in business ecosystems since their competitiveness is increasingly dependent on the effective collaborations within the ecosystem. The constant dialogue and coordination of strategic and operational activities represent the preconditions to be competitive and operate in the current market. In other terms, stakeholder management covers a crucial function for business ecosystems because it enables community actors to provide more appealing, innovative, integrated, and coordinated services, and thus to meet changing customers' or users' expectations.

As further explained in the following section, the concept of the business ecosystem is wider than the "cluster" concept. Although the two terms are often used synonymously, a "cluster" is generally defined as a geographic concentration of actors operating in a particular field that compete but also cooperate to each others. A cluster can be strategically developed as part of large-scale industrialization processes, leading by a dominant player or an institution, or a group

of companies/institutions. On the contrary, an "ecosystem", is a network of many different players from various synergic fields who are directly or indirectly connected to each other. In this perspective, clusters can be developed within a business ecosystem.

From a theoretical perspective, the research domain of this PhD thesis deals with the role of stakeholder management for managing companies or organizations in complex business ecosystems. In this perspective, maritime logistics represents an ideal research field for addressing the stakeholder management concepts, given the specificities of the industry and the variety of activities, actors, stakeholders, and relationships. However, the complexity of studying stakeholder management in this domain derives not only from the specificities of maritime logistics but also from the unique characteristics and objectives of the actors populating maritime logistics ecosystems.

The concept of maritime logistics has changed over the years along with the developments of multimodal and intermodal transport as well as the integration of transport modes and logistics services (Panayides, 2002, 2006). Integration is at the centre of the concept, and it does not only refer to physical (intermodal) integration, but also economic, strategic, and organisational integration. This requires the development of new governance settings and structures as well as, a well-planned strategy of stakeholder management to handle the processes inter and intra the organisations of the ecosystem. According to previous studies, the concept of maritime logistics derives from the merger of the principles of supply chain management and logistics (Bichou and Gray, 2004; Nam and Song, 2011; Palmieri et al., 2019; Panayides, 2002, 2006; Panayides and Song, 2013; Woo et al., 2011). The official definition of supply chain management provided by the Council of Logistics Management states it deals with the planning and management of all activities involved in sourcing and procurement, transformation, and all logistics management activities, stressing the relevance of coordination and collaboration with partners (e.g., suppliers, intermediaries, third-party service providers, and customers).

When it comes to logistics, the Council defines logistics as the part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point-of-origin to the point of consumption. Then, logistics creates value when making products/services available in the right place at the right time to meet customers' expectations. Place and time utility are even more critical for maritime logistics since it is called to deal with a broader spectrum of actors and services. Indeed, Nam and Song (2011) argue that maritime logistics consists of the management of maritime transport (e.g., shipping and ports), traditional logistics functions (e.g., storage, warehousing and offering distribution centre services), and integrated logistics activities (e.g., value-added services). Besides, it encompasses

the management of relationships with both public and private stakeholders, given the different nature of the actors embedded in the ecosystems (Notteboom and Winkelmans, 2003; Panayides, 2006).

Lam and Van de Voorde (2011) state maritime logistics cover all the activities of planning, coordinating, and controlling passenger and cargo flows from the point of origin to the point of destination. This "end-to-end" perspective is not limited to perform the operations for cargo delivery and it also includes the management of both physical, information and financial flows (Christopher, 2011). As a result, maritime logistics involves a variety of actors which share the same objectives of reducing costs, improving (operational) efficiency, ensuring the sustainability of operations, complying with regulation, increasing customer satisfaction and, ultimately, retaining or rising market share (Sys and Vanelslander, 2020a). In this perspective, a collaborative approach and cooperative agreements are essential. Indeed, the efficiency and effectiveness of maritime logistics flows rely essentially on the existing relationships among the heterogeneous actors populating maritime logistics ecosystems, such as port authority, port operators, terminal operators, shippers, shipping agents, logistic service providers, freight forwarders, customs authorities, and so on (Dooms et al, 2015). From a governance perspective, these cooperative agreements can range from top-down mechanisms, which are government-influenced alliance formation, to bottom-up collaborations, leading by public or private organisations within the ecosystem (Haezendonck, 2018).

Although stakeholder management emerges as a key function in some studies on the port authority domain (see e.g., Notteboom and Winkelmans, 2003; Dooms and Verbeke, 2007; Dooms et al., 2013), further research is still required to investigate how key actors of maritime logistics manage the relationships with stakeholders. Indeed, the success of maritime logistics ecosystems is no longer determined by transport and logistics infrastructure and operational efficiency along all stages of cargo journey: it is increasingly being determined by the way the actors succeed in communicating, coordinating, and managing interactions with each other and with the different categories of respective stakeholders (Henesey et al., 2004; Panayides, 2006), as discussed below.

1.1.2. Key actors of maritime logistics ecosystems

As maritime logistics is expanding its traditional focus (Notteboom and Rodrigue, 2005; Panayides and Song, 2013), the identification of the key actors of maritime logistics ecosystems inevitably leads to a wide diversity in interpretations. The characteristics of the competitive environment, the international and national regulatory framework, and the typology of passenger and cargo flows (Zhang, and Lam, 2013; Doloreux, 2017), are just some of the drivers that shape

the boundaries of maritime logistics ecosystems and their community. Consequently, these drivers affect viable stakeholder management practices and tools by the actors populating maritime logistics ecosystems because they must manage different typologies of stakeholders and related needs and interests. The behaviour of maritime logistics actors and their stakeholder management approaches are also affected by government policies and public opinion which have started to attach great importance to specific issues concerning maritime logistics (e.g., environmental and safety/security issues) (Acciaro, 2015; Mehrnaz Ashrafi et al., 2020; Dooms and Verbeke, 2007).

According to recent prominent studies on maritime logistics and stakeholder management in the port and maritime domain (Acciaro, 2015; Mehrnaz Ashrafi et al., 2020; De Langen, 2006; De Schepper et al., 2014; Dooms et al., 2013; Dooms and Verbeke, 2007; Ferretti et al., 2017; Notteboom et al., 2015; Notteboom and Winkelmans, 2003; Panayides and Song, 2013; Pinto et al., 2015), this PhD thesis identifies three main groups of actors embedded in modern maritime logistics ecosystems (i.e., "maritime cluster", "port" and "maritime city and institutions") according to the role they cover within ecosystems (Table 1.1).

The maritime cluster is the most diverse and complex group. Indeed, the extant literature suggests different perspectives to address the concept of "cluster", including location theory (Krugman, 1991), industrial organization theory (Dennison, 1937), transaction cost theory (Williamson, 1975), industrial districts theory (Porter, 2000). However, the most cited definition is from Porter (2000) who states: "*clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate*". In this perspective, clusters are non-random geographical agglomerations of organisations with similar or highly complementary capabilities which aim to increase productivity, stimulate innovation, and attract new firms. The definition of Porter (2000) provides three key elements for defining maritime clusters: i) firms active in the same or related industries; ii) geographical proximity; iii) vertical or horizontal relationships.

Martin and Sunley (2003) argue the main issue regarding the concept of the cluster is the lack of a clear boundary in both the spatial range and the internal socio-economic dynamics. Such ambiguity results in the absence of a unique definition of the maritime cluster (Zhang and Lam, 2017; Doloreux, 2017). After reviewing research articles published in the last 15-years, Doloreux (2017) provides three perspectives to define maritime clusters, namely as an industrial complex, an agglomeration of interlinked industries, and a community-based network. In the first case, maritime clusters include a mix of maritime and maritime-related industries which are

interconnected by significant flows of goods and services. They comprise a large set of economic activities which have a direct, indirect, induced, and parallel effect on the maritime economy (Pagano et al., 2016). According to the second perspective (i.e., agglomeration of interlinked industries), maritime clusters are defined as an agglomeration of industries linked to each other in terms of knowledge, skills, inputs, demand, and/or other factors. This definition is particularly focused on the key characteristics of business activities as well as competing and collaborating strategies performed by the firms in maritime clusters. Finally, maritime clusters can be defined as a community-based network, i.e. a geographical concentration of maritime industries and institutions aiming at innovating the business (Doloreux, 2017). This definition stresses the inter-firm interactions as well as the importance of the institutional environment that plays a key role in stimulating the innovation capability and entrepreneurial activity of firms and organisations involved in the maritime industries.

Shi et al. (2020) provide a more pragmatic definition of maritime clusters according to the concept of spatial agglomeration and the consistency of maritime-related economic activities. The Authors identify a core traditional maritime cluster, which includes firms involved in shipping as well as cargo and passenger transportation. Then, they extend the scope of the cluster to maritime logistics-related sectors, such as maritime intermediate services, naval construction, and maritime support services. Finally, the Authors give a broader definition of maritime clusters to encompass fishing and aquaculture, maritime recreation, and tourism sectors.

In line with this definition, Zhang, and Lam (2013) classify the functions of maritime clusters into two basics typologies: logistics-based function, focusing on logistics services embedded in maritime logistics (e.g., inland transportation, ocean shipping, auxiliary, and intermediate services), and service-based function, focusing on high-end maritime services (e.g., legal advisers, marine insurers, banks and accountants, research, consultancy, education, and shipping agencies services).

According to the extant literature and considering the lack of a unique definition, this manuscript defines the maritime cluster as a network of firms and organisations that may be supported by national or local authorities (i.e., actors include in "maritime city and institutions") to cooperate for innovating the business and improving maritime logistics' performance. In other terms, maritime clusters are formed by a plethora of actors, as reported in Table 1.1.

Although many eminent studies (e.g., De Langen, 2002; Doloreux, 2017; Shi et al. 2020) include the actors of the second group (i.e., port) in the definition of maritime cluster, this PhD thesis splits these categories to stress the specific bordered domain where they operate. The Author agrees with previous academic contributions, but he wants to examine some peculiarities of port

actors' managerial practices, especially port authorities. Indeed, ports have been traditionally defined as logistics nodes made up of infrastructure and superstructures for receiving ships and other means of transport, for handling cargo and passengers from ship to shore and vice-versa, and for providing logistics services that create value for users and/or customers (Paixão and Marlow, 2003). In this perspective, ports are melting points for contacts and contracts between a multitude of actors and interests who collaborate for the creation and distribution of wealth within maritime logistics ecosystems (Notteboom and Winkelmans, 2003).

Table 1.1. Key actors of maritime logistics ecosystems.

Group	Key Actors
Maritime cluster	Shipping lines (container, ro-ro, cruise companies, etc.) and tramp operators (liquid bulk, dry bulk, etc.); shipping agencies; inland transport and logistics companies (road hauliers, railway companies, logistics providers); managing entities of maritime logistics nodes (warehouse, dry ports, inland terminals, etc.); forwarding agents; shippers (cargo owners); maritime equipment providers; shipyards; classification societies; manning agencies; brokers; consulting firms; maritime education and training organisations; financial community; R&D organisations; universities.
Port	Port authorities; terminal operators; dockworkers; labour unions; port service providers (pilots, mooring and towage operators, customs, coast guard, etc.).
Maritime city and institutions	Local communities; societal groups of interests; passengers; regulators; institutions; governments; public officials; notational and international public bodies; nongovernmental organisations (NGOs); environmental organisations and activists;

Source: Author's elaboration

Although the port industry has always been considered as an old-fashioned and conservative environment, the severe and multiple pressures from stakeholders along with dramatic socio-economic changes in maritime logistics have recently forced port actors to revise their managerial approach (Paixão and Marlow, 2003; Van der Lugt et al., 2013; Verhoeven, 2010).

Indeed, the success of a port is no longer dependent exclusively on the performance of terminal operators and port labour, but it is increasingly relying on its ability to coordinate day-to-day cargo and passenger flows along the entire logistics supply chain and proactively respond to stakeholders' requirements (Verhoeven, 2010). In this context, the port authority, as a focal actor in the port domain, is challenged to manage the relationships with a wide array of actors and to provide critical stakeholders of maritime clusters and maritime cities with adequate incentives to

support port survival and development (Notteboom et al., 2015; Notteboom and Winkelmans, 2003).

Verhoeven (2010) puts forward three strategic responses of port authorities to face the increasingly complex environment, i.e., conservator, facilitator, and entrepreneur approach. Whereas a conservator port authority focuses on being simply a good housekeeper, running the high risk of being marginalised within maritime logistics ecosystems, a facilitator port authority engages the role of mediator and matchmaker between economic and societal interests, creating strategic relationships with stakeholders within and beyond the port domain. The entrepreneur port authority goes one step further and adopts an outspoken commercial attitude as an investor, service provider and consultant on a broader geographical scope (Verhoeven, 2010). These new strategic responses suggest that the strategic management of port authorities is going towards a more stakeholder-oriented perspective (Van der Lugt et al., 2013).

The last group of actors deals with maritime cities and institutions. It includes actors (e.g., local communities) who do not have an operational role in maritime logistics activities, but they can significantly affect the overall performance of the overall ecosystem (Acciaro, 2015; Dooms et al., 2013). Indeed, social legitimacy, social licence to operate, and good public image are key preconditions for maritime logistics actors to be competitive in modern ecosystems (Mehrnaz Ashrafi et al., 2020). Dooms, Verbeke, and Haezendonck (2013) demonstrate the ability to gain a social licence to operate in this industry depends on the implementation of an effective stakeholder engagement strategy, moving from ad-hoc involvement to the continuous inclusion of stakeholders in decision-making processes. Besides, maritime logistics actors are demanded by governments and society to take prompt action to minimize the negative externalities on maritime cities. This is largely attributed to the growing awareness of public opinion on environmental and social urgencies related to maritime logistics (Acciaro, 2015; M. Ashrafi et al., 2018; Dooms et al., 2013; Haezendonck, 2018). Indeed, the industry is catching up with international trends related to sustainability agendas and both national governments and international institutional bodies cover a key role in this domain as regulators. For instance, one of the most important international actors in the maritime logistics ecosystem is the International Maritime Organization (IMO), the United Nations specialised agency responsible for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships, which gives a direction to the industry and affects the strategic decisions of maritime clusters and ports actors.

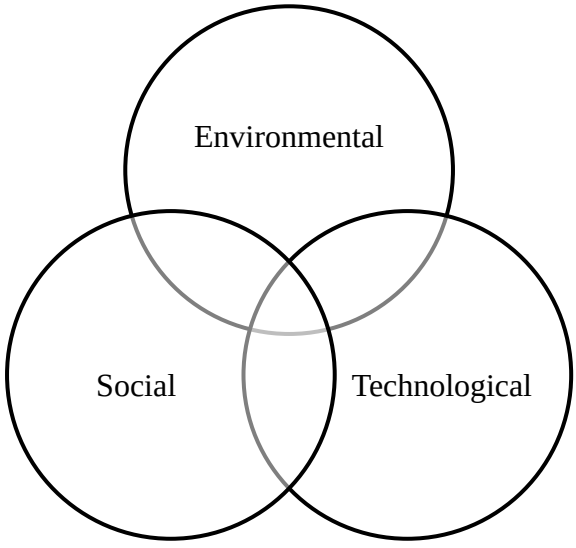
In conclusion, key actors of maritime logistics ecosystems may have public, private or hybrid nature, consistent with their characteristics and the specificities of ecosystems. This is a pivotal

aspect when investigating stakeholder management practices because it changes the perspective of salient stakeholders and strategic objectives pursued by each actor. Moreover, academics stress existing relationships between actors belonging to both the same and different groups. For instance, port authorities, which are included in the port group (Table 1.1), must manage relationships with both shipping companies and logistics operators (i.e., actors of the maritime cluster) as well as local communities and governments (i.e., actors of maritime city and institutions). At the same time, port authorities are called to address the requirements and claims from stakeholders inside the port domain, such as terminal operators, dockworkers, labour unions, port service providers.

1.1.3. The main challenges for maritime logistics ecosystems

Maritime logistics literature has shed light on several urgent challenges for the main actors operating within the maritime logistics ecosystems. These challenges can be grouped into three categories: environmental, social, and technological challenges (Acciaro, Ghiara, et al., 2014; Acciaro, Vanelslander, et al., 2014; M. Ashrafi et al., 2018; Denktas-Sakar and Karatas-Cetin, 2012; Dinwoodie et al., 2012; Dooms et al., 2013; Ferretti et al., 2017; Haezendonck, 2018; Lam and Notteboom, 2014; Langenus and Dooms, 2018; Psaraftis, 2016; Sys and Vanelslander, 2020a). As many of the challenges stretch through the entire ecosystem, they are often expected to overlap and be intertwined (Figure 1.1).

Figure 1.1. The main challenges for maritime logistics ecosystems.



Source: Author's elaboration

Academics agree, in absolute terms, ships are the major source of atmospheric emissions and associated climate change, global warming, and adverse implications on human health, especially in maritime cities (Cullinane and Cullinane, 2013). Around 80% of global trade by volume is carried by sea (UNCTAD, 2020), which makes shipping the backbone of the global economy. Although shipping is widely considered greener than other transport modes, such as aviation or inland transport, it is responsible for 2.9% of global anthropogenic greenhouse gas (GHG) emissions according to the latest IMO greenhouse gas (GHG) study (4^{th} IMO GHG study, 2020). At the beginning of 2020, the total world fleet has overcome the 98,000 commercial ships, equivalent to a capacity of 2.06 billion deadweight tonnage (UNCTAD, 2020). Considering the global commercial shipping fleet growth rate (4.1% in 2019, one of the highest over the last decades), the IMO argue GHG are expected to even increase from 90% to 130% by 2050 compared to the baseline year of 2008, depending on the economic recovery after the COVID-19 pandemic effect. This also increases pollutants reaching the air, especially sulphur dioxide, nitrogen oxides and particulate matter which are particularly harmful to people living in maritime cities. In this regard, shipping generates 12% of global sulphur emissions, which is one of the main causes of acid rain and respiratory diseases in maritime cities.

To mitigate the problem, in 2018 the IMO established to, at the very least, halve shipping-related CO_2 emissions by 2050, as compared to the level in 2008. Besides, the MARPOL Annex VI protocol reduced the acceptable sulphur levels in shipping fuel from 3.5% to 0.5% globally from 1 January 2020. Some areas adopted even stricter regulations (e.g., Emission Control Areas). In the Baltic Sea, the North Sea and coastal Canada and the United States, including the US Caribbean, the limit of 0.1% sulphur limit has been in force since 2015. Consequently, shipping companies are investing in new viable solutions to cut emissions (Gilbert et al., 2018), including cleaner fuels (e.g., low carbon content, Liquefied Natural Gas, Liquefied Petrol Gas), alternative fuels (e.g., biofuels, hydrogen, and ammonia) and innovative energy systems (e.g., fuel cells, wind propulsion systems, waste recovery, exhaust heat recovery systems etc.). Green strategies have been an increasing trend in shipping to voluntarily undertake environmental measures to tackle environmental impacts and sustain the economic growth of companies (Psaraftis and Kontovas, 2010; Yang et al., 2013)

The environmental challenge also requires the contribution of the other actors of maritime logistics ecosystems, such as terminal operators, inland terminals, transport and logistics operators, and shippers. A massive re-engineering of maritime logistics operations is needed in favour of eco-friendly packaging, load and route optimization, sustainable distribution networks and distribution hubs (Notteboom et al., 2020). Besides, the modal shift to environmental-friendly transport mode combinations is crucial to cut the negative externalities of maritime logistics. In

this perspective, institutions are expected to stimulate the use of barges, rail, and shortsea shipping to cut emissions of road hauliers and mitigate atmospheric emissions across maritime logistics operations. A regulatory framework and a holistic solution are needed to face environmental challenges in maritime logistics ecosystems, which requires cooperation and coordination between international institutions (e.g., IMO) and the world's various national and regional powers (Cullinane and Cullinane, 2013).

Maritime logistics has also a significant social impact on the life of every human being in maritime cities (Acciaro, 2015). While environmental challenges have the most direct impact along the shorelines, social concerns have demonstrated to affect maritime logistics ecosystems in numerous ways. Human rights, health, employment, land usage and congestion are just some of the main social challenges and concerns for maritime logistics ecosystems. Local communities are crying out for a reduction of externalities generated by the industry (Dooms et al., 2013). Many maritime cities are home to environmental organisations, societal groups of interests, activists, and unions that put pressure on local politicians to act for a change in the direction of sustainability. Beyond the environmental issues debated above, these actors deserve special attention in the context of transport infrastructure planning and ports' expansion (Dooms et al., 2013). Indeed, ports tend to be located in lucrative areas for other real estate development and as maritime cities are growing globally, the conflict between opposing interests in land allocation constitutes a cause of social unrest. In most cases, ports' expansion projects are characterised by long-term impacts and a high level of uncertainty which may result in changes in the socio-economic, technological, and political environment (Dooms et al., 2013). In this perspective, local communities' expectations must be considered since they may hinder projects development due to the emergence of institutional distance and social conflicts with institutions, port managers and other actors of maritime clusters.

Labour issues constitute another critical social challenge in maritime logistics ecosystems. Shipping and ports have long been a source of employment for maritime cities. However, these industries are currently facing a workforce crisis. In the first case, fewer citizens are attracted by a maritime career due to poor life expectations. The Baltic and International Maritime Council (BIMCO) indicates a shortage of 16.500 officers and a surplus of 119.000 seafarers. The forecast confirms a negative trend in the next years and this should be a warning for shipping companies to revise their human resource management. A career in the maritime industry should be promoted as an attractive and viable option for young people of maritime cities by providing better working conditions and establishing collaborations with universities and other education and training organisations on the territory (Mitroussi and Notteboom, 2015). When it comes to ports and, in general, maritime logistics, the demand for an educated and skilled workforce is rising

everywhere and the industry is facing challenges in attracting professionals (Satta et al., 2019). Moreover, diversity in gender and race are also called for in an industry currently dominated by middle-aged white men. Esser et al., (2020) argue innovation and digital technologies are dramatically shaping bargaining power among parties within the job market. New information and communication technologies (ICT) and automation require higher-level management jobs and multi-skilled employees. Therefore, maritime cluster firms are challenged to develop a new approach for managing issues and relationships with their employees. Training and business education are pivotal in this context as well as a good motivation strategy (Mitroussi and Notteboom, 2015). This approach makes firms more competitive in terms of employees' learning skills, reputation, customer satisfaction, and market share (Verbeke et al. 2006).

The last category of challenges for maritime logistics ecosystems deals with technological advancements and innovations. Competitiveness has always been associated with innovations, even more since the advent of digital technologies in maritime logistics worldwide (Carlan et al., 2017). Technological advancements can provide several disruptive opportunities for the industry, preventing unforeseen breaks and bottlenecks, increasing efficiency, and creating value-added integrated services (De Langen and Douma, 2020). However, several studies demonstrate maritime logistics actors are lagging in the development of information and communication technologies (ICT) as well as digital systems (Acciaro and Sys, 2020).

Sys and Vanelslander (2020b) claim the next big challenge for maritime logistics will be the transformation toward digitalised ecosystems. Indeed, digitalisation has resulted in an exponentially increasing amount of data available deriving from the use of mobile technology, the Internet of Things, social networks, cloud computing, and other devices inserted into existing ships, especially newbuild vessels, and vehicles, providing more data on deliveries and conditions of the cargo (Fruth and Teuteberg, 2017). This is crucial for well-planned coordination among transport and logistics actors as well as for customers' satisfaction. In the port context, data can improve efficiency in handling the incoming cargo and planning for arrivals, reducing traffic congestion inside and outside terminals (Acciaro et al., 2018). However, collecting, storing, securing, and sharing data comes with legal challenges and, especially, managerial barriers related to the conservative and non-collaborative behaviour of most maritime logistics actors (Sys and Vanelslander, 2020b). In this perspective, data gathering, analysis and management are at the centre of the international debate. On the one side, these business activities assist the decision-making process, on the other side, sharing data may represent a dilemma. Indeed, emerging digital technologies have introduced a new way to overcome the traditional "vertical silos" approach adopted by the actors of maritime logistics, encouraging a more collaborative attitude. However,

fears still arise over the ownership of data about the way it is shared and who gains the benefits in the end.

The standardisation of ICT systems may determine additional limits to inter-organizational cooperation and supply chain integration (Fruth and Teuteberg, 2017). Unless shipping companies and maritime logistics operators develop shared platforms, systems will still work separately, and no benefits will be provided to actors belonging to the same supply chain as well as to the whole community members. Besides, many ICT systems and related technologies have been proven to become effective at a business level only when a consistent number of actors endorse the initiative, especially those supporting open access platforms (Carlan et al., 2017). In most strategic and operational decisions concerning business innovations, including digital technologies, collaboration is pivotal to induce benefits for all actors working in the same business ecosystem. In this perspective, Acciaro and Sys (2020) use the term "co-innovation" to define a new form of innovation in maritime logistics ecosystems whereby the various actors and respective stakeholders jointly acquire new expertise and create opportunities for new collaborations.

Table 1.2. Overview of the main challenges for maritime logistics ecosystems.

Challenge	Description
Environmental	Climate change adaptation and mitigation; reduction of harmful emissions and other environmental externalities; compliance with stricter environmental regulation; development of more sustainable maritime logistics networks; modal shift to eco-friendly transport mode.
Social	Protection of human health and social needs; respect for labour rights and employees' requirements; increasing attention to transport infrastructure planning and ports' expansion; reduction of externalities.
Technological	Introduction of innovative technologies and digital solutions; development of digitalised maritime logistics ecosystems; improving energy and operational efficiency; reduction of costs; boosting networking & information sharing; support of strategic decision; improvement of flexibility & scalability; development of smart distribution system; filling the lack of technical and managerial know-how.

Source: Author's elaboration

1.2. Research design and research questions

Previous studies have stressed potential solutions for the three main challenges in the maritime logistics domain based on collaborations between the different actors of maritime logistics ecosystems (Acciaro, Vanelslander, et al., 2014; Denktas-Sakar and Karatas-Cetin, 2012; Dooms et al., 2013; Fruth and Teuteberg, 2017; Langenus and Dooms, 2018; Notteboom and Winkelmans, 2003; Stein and Acciaro, 2020; Sys and Vanelslander, 2020b). As reported in Figure

1.1, some overlaps of challenges may exist. This gives actors the possibility to address simultaneously a multitude of problems and generate synergies and benefits for the whole community in several aspects. Collaborative behaviours among the actors of the ecosystem jointly with the development of knowledge sharing and transfer processes not only favour the diffusion of expertise and know-how, but they also increase the prosperity of a broad community, including actors and stakeholders of maritime cities (e.g., local communities, societal groups of interests, NGOs, etc.) (Van de Voorde, 2016). In this perspective, stakeholder management practices are extremely relevant to move toward a more cooperative ecosystem, which goes further through simple one-to-one collaborations and establishes wider and more stable networks in the long run (Sys and Thierry Vanelslander, 2020b). According to the prominent studies of Dyer and Singh (1998), Wassmer and Dussauge (2011), as well as Parise and Casher (2003), networks constitute an additional source of competitiveness when actors combine, exchange, or invest in idiosyncratic assets, competencies, and knowledge. Competitive advantages of networks include lower costs, better access to skilled labour, specialised suppliers, value-added services, and knowledge spill-overs (Verbeke and Vanden Bussche, 2005). In this perspective, the sharing of resources and efforts may constitute additional sources of competitiveness for maritime logistics ecosystems as networks of heterogeneous actors and stakeholders.

The variety of actors and the increasing importance of networks make maritime logistics an interesting ecosystem to investigate stakeholder management practices and related business opportunities. Indeed, the management of formal and informal relationships with salient stakeholders is ever more crucial for the survival and competitiveness of the key actors of maritime logistics ecosystems. However, stakeholder management has appeared in academic discussions on maritime logistics only in the early 2000s, leaving several rooms to further studies (Dooms and Verbeke, 2007).

Relatedly, this PhD thesis addresses the three urgent main challenges for maritime logistics ecosystems (i.e., environmental, social, and technological challenges) by applying the stakeholder management perspective to answer the following four research questions:

Main research questions:

I. Who are the principal actors in maritime logistics ecosystems which make extensive use of stakeholder management practices?

II. Which are the main relationships of each key actor belonging to the maritime logistics ecosystems that require in-depth investigation?

III. To what extent stakeholder management practices can support maritime logistics actors to tackle the three main challenges (i.e., environmental, social, and technological challenges) that the industry is experiencing?

IV. What are the main technological, social, and environmental benefits for maritime logistics ecosystems?

Given the wide scope of these four research questions as well as the peculiarities of the maritime logistics industry and the specificities of strategic behaviours and objectives characterising its diverse economic actors (e.g., private, public, hybrid, etc.), the PhD thesis examines the perspectives of multiple key actors of maritime logistics ecosystems. It explores both their strategies and behaviours to stress the benefits and opportunities emerging from stakeholder management practices.

Although the economic challenges seem missing in the proposed framework of analysis (cf. the triple bottom line concept of Elkington), they are intrinsically included in each of the three main challenges addressed. Indeed, maritime logistics actors cannot develop sustainable strategies in the long run without regard to economic issues. Therefore, the Author's objective in this PhD thesis is to emphasise the environmental, social, and technological challenges, also considering the economic aspects in the argumentation.

The research design grounds on the paradigm of pragmatism, which argues that a researcher can choose a theoretical and methodological approach based on the research question (Tashakkori et al., 1998). This paradigm does not require any justification in terms of ontology, epistemology, and methodology. Pragmatism refers to the acquisition of knowledge as a process of inquiry through constant interactions between the assumptions and actions of the researcher (Morgan, 2014). Pragmatism relates to the application of mixed methods, which determine an original and pluralistic approach to not constrain the activity of the researcher (Johnson and Onwuegbuzie, 2004). Besides, the different topics addressed by this PhD thesis cannot be investigated through only a single and homogenous methodological approach since their heterogeneous and complex nature. Therefore, the integration of mixed methodological approaches could, on the one hand,

try to answer the research questions, and, on the other hand, positively add to maritime logistics and management literature by providing different empirical results and stakeholder perspectives.

Given the above, this PhD thesis provides cumulative research (i.e., a compilation of research papers) which consists of four research papers and publications aiming at investigating stakeholder management practices in maritime logistics, considering multiple actors of the ecosystem and diverse perspectives. Table 1.3 summarises the papers and publications which constitute the four empirical chapters of the manuscript.

Table 1.3. . Research papers and publications included in the PhD thesis.

Chapter	Paper title	Authors	Year	Journal/Conference
3	The impact of innovation on dock labour: evidence from European ports	Notteboom T., Vitellaro F.	2019	Impresa e Progetto Electronic Journal of Management
4	Digital technologies and business opportunities for logistics centres in maritime supply chains	Parola, F., Satta, G., Buratti, N., Vitellaro, F.	2020	Maritime Policy & Management
5	Social media as a new way to communicate corporate social responsibility in ports: the case of Twitter in the port of Rotterdam	Vitellaro, F., Satta, G., Parola, F., Buratti, N.	2021	World of Shipping Portugal Conference[1]
6	Green strategies in the cruise industry: from theory to practice	Satta, G., Parola, F., Morchio, G., Vitellaro, F.	2020	The Cartagena dialogue on Cruise, Ports and Cities[2]

Source: Author's elaboration

Research activities performed in the context of the PhD project also include the following papers and publications. Nonetheless, they have not been included in the PhD manuscript for parsimony:

- Parola F., Satta G., Vitellaro F. (in press), "Port hinterlands", in Encyclopaedia of Transportation (Elsevier).
- Satta G., Parola F., Musso E., Vitellaro F (2020). "Financial operators in port infrastructures: Typologies, objectives and global strategies". In: Wilmsmeier G., Monios J. (Eds), Geographies of Maritime Transport. Edward Elgar Publishing, UK, ISBN:

[1] Under review for the Special Issue on "Port Business and Green Innovation" of the 2021 World of Shipping Portugal, Maritime Business Review (Emerald Publishing).

[2] The final version of the research paper reported in the PhD manuscript refers to the submission for the Special Issue "Cruise Shipping, Ports, and Destinations", Research in Transportation Business & Management (Elsevier); the paper is under review.

9781788976633.

- Parola, F., Satta, G., Persico L., Vitellaro F. (2019), "Competences, skills and career expectations: insight from Italian seafarers' labour market", Impresa Progetto – Electronic Journal of Management, DOI: 10.15167/1824-3576/IPEJM2019.3.1231
- Parola F., Satta G., Buratti N., Vitellaro F. (2019), "Social media marketing in hybrid organizations: evidence from port management bodies", Società Italiana Marketing Conference, 24-25 October, Piacenza (Italy), ISBN978-88-943918-3-1
- Parola F., Satta G., Buratti N., Vitellaro F. (2018), "Digital technologies as a marketing opportunity for logistics centres: a literature review", Società Italiana Marketing Conference 2018, 18-19 October, ISBN978-88-943918-2-4.

1.3. Overview of the PhD thesis

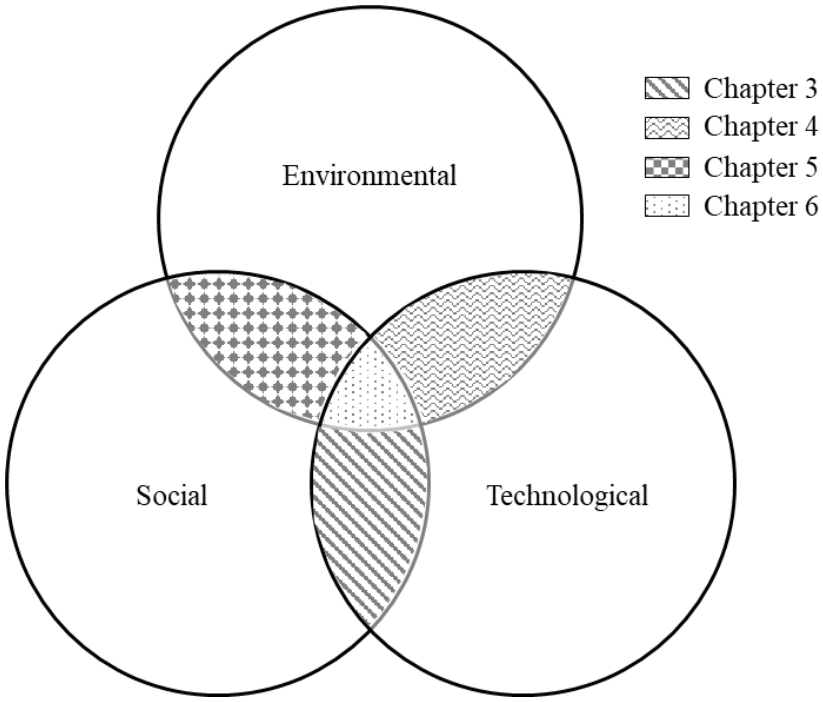
Given the set research questions, the PhD thesis consists of 7 chapters. The four empirical chapters of the PhD manuscript (i.e., chapters from 3 to 6) are preceded by this introduction as well as an extensive literature review of the main theoretical constructs of the stakeholder theory as well as the stakeholder relationship management perspective, on which the empirical part of the manuscript is grounded on (Chapter 2). The literature review aims to comprehend the foundations and managerial benefits of stakeholder relationship management and corporate social responsibility, which can help the actors of maritime logistics ecosystems to tackle the main challenges of the industry (i.e., environmental, social, and technological challenges).

The empirical four chapters of the manuscript address different challenges for maritime logistics ecosystems, as reported in Figure 1.2.

Chapter 3 addresses both social and technological challenges. It assumes the perspective of terminal operators and investigates to what extent innovation (e.g., digital technologies, automation, labour organisation, organisational structure, etc.) can affect port labour performance and their relationships with dockworkers. The chapter proposes an original conceptual framework to identify, classify and evaluate innovative initiatives of terminal operators addressed to enhance dock labour performance. The conceptual approach not only considers technological innovations but also organisational and regulatory innovations. This chapter provides also anecdotal evidence of European seaports to empirically test the original framework. The empirical outcomes reveal that innovative initiatives can have very different characteristics and ramifications when looking at the type of innovation, the boundaries of innovation, the nature of the actors involved, the (expected) magnitude of impact and the impact of labour performance. According to the

theoretical constructs of stakeholder management, the outcomes stress terminal operators should acknowledge the strong interdependence between the management of relationships with dockworkers and their overall performance. In this perspective, a review of the stakeholder prioritisation process is argued. Indeed, terminal operators are expected to give priority attention to dockworkers, incorporating new measures in the innovation process to stimulate their motivation, commitment, and sense of belonging to the firm.

Figure 1.2. The research design: challenges addressed by the empirical chapters of the manuscript.



Source: Author's elaboration

Chapter 4 examines how the adoption of emerging digital technologies can provide valuable business opportunities for the managing entities of the logistics nodes embedded in maritime supply chains. Grounding on the principles of stakeholder relationship management (SRM), it considers the primary perspective of terminal operators and provides an ad-hoc conceptual framework for disentangling the main business benefits arising from these technological innovations in terms of increased efficiency of operations, service differentiation, strengthening of the strategic decision-making process, and greener solutions. The empirical outcomes suggest the joint and integrated adoption of digital technologies by the managing entities of maritime logistics nodes is expected to make maritime supply chains more efficient, sustainable, and

greener. Besides, digital technologies are expected to stimulate and strengthen collaborations and relationships in maritime logistics ecosystems because their success relies on the number of maritime logistics actors who endorse innovation. This chapter also debates managerial and marketing implications for both academics and practitioners, providing valuable insights to build broader, more efficient, greener and more competitive networks.

Chapter 5 addresses the environmental and social challenges of maritime logistics. It deals with corporate social responsibility (CSR) communication strategies of port managing bodies (PMBs) which have an increasingly key function when searching for consensus of stakeholders and "license to operate". In this context, the advent of web 2.0 and social media have recently provided PMBs with unprecedented opportunities to redesign and strengthen their communication strategies. Therefore, this chapter examines the current state of the art concerning the adoption of the most popular social media (i.e., Facebook, Twitter, Instagram, YouTube, and LinkedIn) by European PMBs to reach stakeholders and meet their expectations. Moreover, it investigates the use of social media for CSR communication purposes by providing an in-depth case study analysis of the use of Twitter by the Port of Rotterdam. The empirical results shed light on the extensive use of social media by European PMBs. Besides, the content analysis of the tweets published by the Twitter account of the Port of Rotterdam advocates the strong commitment of the port to green initiatives, especially in reducing the port carbon footprint and boosting the energy transition. The chapter provides valuable managerial insights and future research avenues on the use of social media by PMBs to deal with stakeholders, especially local communities, and communicate the port's efforts and commitment to social and environmental issues.

Chapter 6 deals with all the three main challenges of maritime logistics (i.e., environmental, social, and technological challenges) assuming the perspective of cruise lines. The relentless growth of the industry (considering the period before the outbreak of the COVID-19 pandemic) has been accompanied by an increasing interest of civil society in the social and environmental externalities generated by cruise lines. Due to the increasing stakeholders' pressure, cruise lines are expected to be more responsible, especially when their itineraries call densely populated maritime cities or territories characterised by a fragile environment. In line with the principles of CSR, they have been recently developing green strategies to mitigate the negative impacts on the environment as well as to strengthen their social license to operate. The chapter aims to deepen knowledge on green strategies of cruise lines and adds to the ongoing academic debate on green technological solutions in the industry. It proposes an original conceptual framework to identify and evaluate the most promising green investment options according to five categories of green strategies (i.e., ship propulsion systems and alternative fuels, ballast water treatment systems, technical solutions for energy and environmental efficiency, waste treatment systems, automation

and digital interventions). Environmental benefits, as well as managerial weaknesses and strengthens associated with each green investment option, are debated and compared. Finally, the original conceptual framework is empirically tested on multiple case studies to examine the current state of the art in the cruise industry as well as the real commitment of cruise lines to green strategies. The chapter provides anecdotal evidence on three major cruise lines (i.e., Royal Caribbean, Norwegian Cruise, and Carnival) to support the conclusions and implications for academics, practitioners, and policymakers.

In conclusion, research implications, as well as managerial recommendations, are provided in Chapter 7 along with future research avenues. The last chapter also highlights managerial implications for the investigated maritime logistics actors grounding on the theoretical constructs of stakeholder management.

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CHAPTER 2

A REVIEW OF STAKEHOLDER THEORY

2. A review of Stakeholder Theory

This chapter presents a detailed literature review of Stakeholder Theory. It provides the reader with the key theoretical constructs and basic terminology that the following chapters of the PhD thesis refer to. The chapter grounds on the discussion of the principal academic contributions to stakeholder management. The literature review explains the origin of stakeholder theory, addressing the main concepts and the matter of "justification". Moreover, it defines the theoretical foundations and principles of stakeholder relationship management (SRM) and corporate social responsibility (CSR).

The chapter aims to bring to light the main managerial benefits related to SRM and CSR which can help the actors of maritime logistics ecosystems to tackle the main urgent challenges of the industry (i.e., environmental, social, and technological challenges).

2.1. The Stakeholder Theory

2.1.1. The theories of the firm: the strategic relationship between the organisation and the environment

The stakeholder theory is considered one of the theories. It may be considered as the result of two different theoretical approaches investigating the relationship between the organisation and the competitive environment (Pivato et al., 2014). The first group of theories emphasises the strong dependence of the organisation on sectoral forces, whereas the second focuses on the business capabilities to influence the dynamics of the competitive environment.

The first group grounds on traditional managerial and economic studies which lay the foundations for the concept of business strategy. In this regard, Mason (1939) and Bain (1956) introduce the structure-conduct-performance paradigm to describe the causal connections among the main features of the sector, such as concentration, diversification, potential barriers to entry, business strategies and quality of products or services. This school of thought claims the firm can hardly influence the environment: it can only choose the sector in which to operate considering its inherent characteristics and strengths. Therefore, the success of the business relies on the ability of the management to recognise and correctly evaluate the key features of the environment and to define a proper strategy for the competitive positioning of the firm.

In the 1960s-1970s, Stanford University's professor Albert Humphrey introduced the SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) to rationalise business processes in the contexts of high uncertainty and strong competitiveness. Andrews (1971) further elaborated on this managerial tool which is still widely used today by academics and practitioners. He argues

corporate strategies aim to ensure a fit between the internal qualities of the organisation (i.e., strengths and weaknesses, such as brand, patents and market development) and the external factors (i.e., threats and opportunities, such as high production costs and uncertainty of consumer behaviour or substitute products). The scope of this approach is to support the strategic decision-making process of the firm by mapping and assessing all the elements affecting the competitive positioning of the firm. Moreover, the SWOT analysis aims to leverage the skills and distinctive features of the organisation to achieve higher success in the sector (Hitt et al., 2012).

The dependency relation between the firm and the competitive environment is also explained by Porter's five forces model (1979), which defines five structural forces shaping the industry, i.e., competition, the potential of new entrants, power of suppliers, power of customers and threat of substitute products. Porter's model helps to analyse the level of competition within a specific industry, and it brings to light the potential business opportunities achievable by the firm, considering the combination of the five abovementioned forces (Sciarelli, 2004). As a result, the considerations of Porter and the Harvard school sustain the success of the organisation largely depends on the context and the relations established with external forces and actors.

Given the above, Pfeffer and Salancik (1978) introduced the resource-dependence theory. The Authors argue the firm needs external resources to run the business and to be competitive. These resources are provided by competitors, suppliers, financiers, and public administration, stressing the relevance of relations with the external actors belonging to the competitive environment. Once again, the management of the relationships with the key players of the sector allows the firm to have greater control over critical resources (Theorelli, 1986).

After examining the theories about the dependency relationship between the organisation and competitive environment, the main theories addressing the influence of the firm on the competitive environment can be now explored. These theories derive from managerial approaches of the 1950s and 1960s, which deal with the influence of large companies on sectoral rules and trends. Selznick (1957) states that not all firms are forced to shape their business strategy for external forces. Indeed, effective leadership skills can support the management to run the business for achieving corporate objectives. The Author makes clear the distinction between organizations that only provide technical services and those capable to influence the environment (i.e., institutions). In this vein, only institutions have the leadership skills to define values, rules, and goals for the sector. They do not have to passively adapt their business strategies and organisational integrity to external forces and pressures, but conversely, they play an active role in shaping the rules of the business competitive environment.

In the 1960s, Chandler (1962) outlines an image of an open and responsive firm towards the evolution and changes of the environment. The Author argues organisations should achieve the skills and competencies to understand the signals from the market and then to develop suitable strategies to keep pace with changes and shifts in market trends and the demand needs and requirements. In other words, the success of the business relies on the capabilities of the management to take advantage of the external factors and to involve appropriate and coherent organisational structure and resources to cope with the changes of the sector. Therefore, according to Chandler's theory organisations and the environment constantly influence each other without the supremacy of anyone.

In the following years, the economic boom, the greater market stability, and the rise of big corporations heavily affect the enterprise-environment relationships (Hoskisson et al., 1999). Firms started to be more independent from environmental dynamics thanks to their growing know-how and managerial skills. In this context, Nelson and Winter (1982) introduced the evolutionary theory which assumes decision-making rules vary over time according to economic, technological and market changes. The focus of the theory is on innovation and R&D which are considered the most critical aspects for the survival and success of the firm. As a result, companies with poor investments in these areas are likely forced out of the sector because they do not meet the growing standards of competitors.

In line with the evolutionary theory, Wernerfelt (1984) introduces the Resource Based View (RBV) theory. He defines the firm as a bundle of resources and capabilities that combined ensure the development of specific competencies, which are the base for a sustainable competitive advantage. Later, Barney (1991) classifies corporate resources in three categories, as follows: physical capital resources (e.g., plants, equipment, and finance), organizational capital resources (e.g., organizational structure, control systems, human resource systems) and human capital resources (skills, judgment and intelligence of employees). On the other hand, capabilities represent the skills and knowledge required to fully exploit capital resources. They can be acquired or easily imitated by competitors or can be unique and incomparable. In this regard, Barney (2001) argues a firm can hold a competitive advantage only when it relies on distinctive and enviable competencies, namely skills and talents related to human resources. Therefore, the Resource Based View (RBV) emphasises the relevance of the organisation's internal resources over external forces: each firm is unique and only its internal skills can determine the success of the business strategy.

The relationship between the organisation and the environment is also investigated by the Austrian school which opposes the assumptions of neoclassical theory. The studies of Schumpeter

(1934) stress the importance of entrepreneurship over market forces. Moreover, Jacobson (1992) sustained the competitive environment does not represent a constraint for organisations, but rather a starting point to build their strategies and actions.

To overcome the dichotomy between the two debated streams of theories concerning the organisation-environment relationship, scholars introduced the systemic perspective (Golinelli, 2000). This approach considers all the relations established by the firm with the external context. Then, any decision taken by the management is not stand-alone, but rather, it is the result of the interactions with different forces and actors belonging to the environment. In this perspective, dependency and influential relations can coexist: the organisation depends on the dynamics of the environment, and it simultaneously affects them. According to the systemic perspective, the organisation can be depicted as a bundle of internal and external relationships, which involve both employees and managers as well as customers, suppliers, and other external actors.

This brief review of prominent theories of the firm highlights the strategic relationship between the organisation and the competitive environment where it operates. This lays the groundwork to examine the origin of stakeholder theory reported in the following sections.

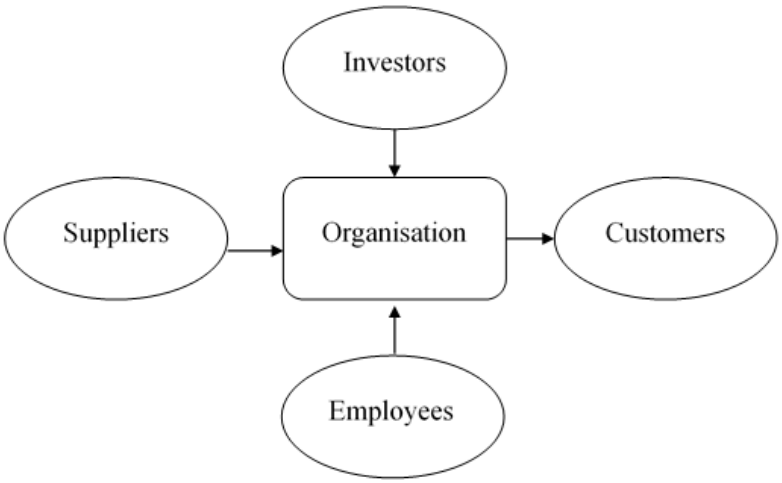
2.1.2. The Stakeholder Theory: main concepts and theoretical constructs

In 1984 Freeman published a seminal work entitled "Strategic Management: A Stakeholder Approach". He focused on the concept of stakeholder to include any individual or group who can affect the firm's performance or who is affected by the achievement of the organization's objectives in the strategic decision-making process. Freeman reconceptualised the nature of the firm, drawing attention to the management of external and internal stakeholders, beyond the traditional pool (i.e., investors/shareholders, customers, employees, and suppliers), for a successful business strategy. He proposed innovative forms of managerial practices aimed to face the challenges and opportunities arising from the adoption of a stakeholder approach. This represents a new way to organise and run the business, based on considering all the needs and requirements of a wide array of parties involved. According to stakeholder theory, the firm is at the centre of a network of relationships with any individual or group with an interest (or a stake) in the business (Freeman and Reed, 1993; Clarkson, 1991; Donaldson and Preston, 1995). Therefore, the firm is expected to manage these relationships and to satisfy the emerging interests for its survival and competitiveness.

Since the publication of this book, several authors have addressed stakeholder management through various perspectives, including agency theory (Hill and Jones, 1992), corporate social responsibility (Donaldson and Preston, 1995), network theory (Rowley, 1997), and resource-

based view (Frooman, 1999). Applying a stakeholder approach, organizations oppose the traditional input-output model and adhere to a managerial perspective based on the collaboration with numerous actors seeking benefits. The distinction between these two managerial approaches is well described by Donaldson and Preston (1995). According to the input-out model (Figure 2.1), investors, employees and suppliers contribute input to the firm which converts them into output (benefits) for customers. Input providers receive the right compensation for their contribution, but no two-way relationship exists.

Figure 2.1. Input-Out model.



Source: Donaldson and Preston, 1995

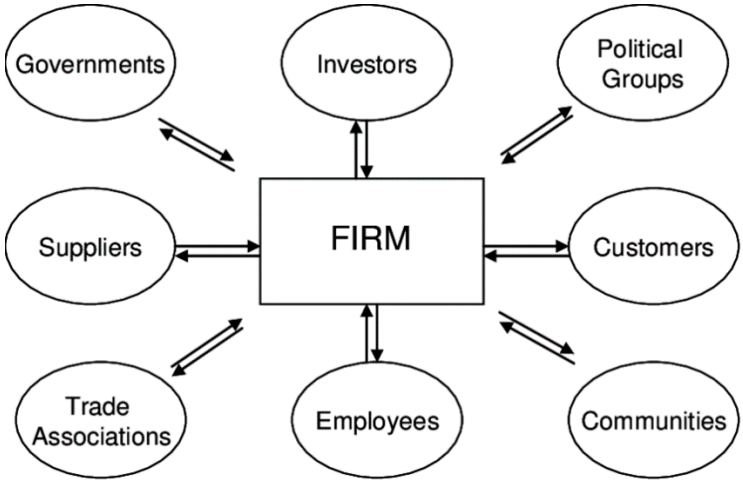
However, the limitations of traditional approaches to strategic management have become evident due to the growing pressure of both internal and external stakeholders on corporate performance and the increasingly changing market rules and conditions (Freeman, 1984). Consequently, the interests of key stakeholders started to be integrated within the objectives of the firm and stakeholder relationship management (SRM) became one of the cornerstones of strategic management.

The central task of SRM is to manage the relationships of various stakeholders and to integrate their interests in a way that ensures a fair distribution of the benefits and the long-term success of the firm (Freeman, 1984). This may be a very challenging task especially when the firm belongs to a wide network due to the necessity to harmonise constantly diverging interests.

In this perspective, compared to the input-output model, the stakeholder model (Figure 2.2) still recognises investors, customers, employees and suppliers as the main stakeholders, but it extends

the pool to those groups with a legitimate interest in the firm, including governments, political groups, communities and trade associations. Moreover, it highlights the mutual exchange of benefits between the firm and its stakeholders. As reported in Figure 2.2, the arrows linking the firm to its stakeholders run in both directions, stressing the existence of two-way relationships.

Figure 2.2. Stakeholder model.



Source: Donaldson and Preston, 1995

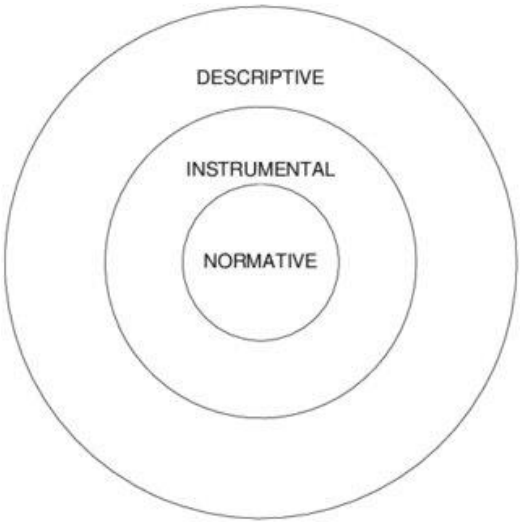
Since the publication of Freeman's book in 1984 academic interest in stakeholder approach to strategic management has grown and broadened (Buysse and Verbeke, 2003; Freeman et al., 2010). The extension of the number of key stakeholders and the increasing attention to their interests have driven academics to further explore and develop the stakeholder theory. For a decade, numerous theoretical and empirical studies have addressed this topic using different approaches and methodologies. This resulted in diverging criteria and implications which made it difficult to understand the core nature and purpose of stakeholder theory. Then, in 1995 Donaldson e Preston identified in their outstanding work three critical perspectives (i.e., descriptive/empirical, instrumental and normative) to analyse the main contributions to stakeholder theory.

According to Donaldson and Preston (1995), the firm is seen as a constellation of cooperating and conflicting interests. Therefore, the descriptive/empirical perspective analyses the characteristics and behaviours of the firm (e.g., the nature of the firm, the managerial practices, corporate internal organisation and objectives, etc.) to identify and evaluate the main relationships with stakeholders.

The second perspective (i.e., instrumental) investigates the links existing between relationships with stakeholders and corporate objectives. In this case, stakeholder theory is used to study to what extent stakeholder management can strengthen corporate performance (e.g., profitability, stability, growth, etc.) compared to classic managerial approaches. In this regard, several studies based on both statistical methodologies and qualitative observations and interviews suggest the adoption of stakeholder principles and practices rises corporate performance instead of alternative managerial strategies (see among others: Aupperle et al., 1985; Cornell and Shapiro, 1987).

The normative perspective assumes stakeholders are any individual or group with a legitimate interest in the firm. Consequently, each stakeholder has an inherent value for the company which must be recognised and weighted by managers to establish suitable behaviours and practices of SRM. In line with this interpretation of stakeholder theory, the analysis of stakeholders is not limited to their contribution to corporate performance (as reported in instrumental perspective), but it also addresses their interests and requirements. For this reason, the normative perspective is typically used to draw the management guidelines and to fix the ethics principles of the firm.

Figure 2.3. The conceptualisation of stakeholder theory perspectives.



Source: Donaldson e Preston (1995)

Although these perspectives are independent of each other, Donaldson and Preston (1995) claim they can be integrated. Figure 2.3 reports the conceptualisation provided by the Authors. The external level deals with the existing relationships between the firm and the economic system (i.e., descriptive perspective); the middle level (i.e., instrumental perspective) aims to evaluate these connections and their impact on corporate performance; and finally, the normative

perspective of stakeholder theory located at the heart focuses on stakeholders' interests and expectations. This conceptualisation shows the foundations of stakeholder theory: the identification of relationships with stakeholders, the evaluation of their value and impact, and the definition of moral obligations and behaviours to meet their interests.

After the examination of the main perspectives of stakeholder theory, Donaldson and Preston (1995) addressed the issue of justification, in other words, why stakeholder theory should be accepted or preferred over alternative managerial approaches, both in theory and practice. The answer relies on the distinctive objectives pursued by the stakeholder theory. Therefore, it finds justification in literature according to the adopted theoretical perspective (i.e., descriptive, instrumental, or normative).

2.1.3. Descriptive justification to stakeholder theory

Descriptive justifications demonstrate the firm is a complex of interests. In this perspective, the stakeholder theory is used to observe reality and analyse existing relationships between the firm and its internal and external stakeholders. Several empirical studies argue that firms use a stakeholder approach to run the business. Among others, Halal (1990) and Clarkson (1991) investigate to what extent this approach is spread among companies. They select a sample of firms and scrutinize how many of them adopt stakeholder management principles and how many do not. In both the aforementioned scientific contributions, the Authors bring to light that a higher number of companies belong to the first group. Although selected companies do not explicitly refer to stakeholder management in their reports, they are demonstrated to perform practices aimed to satisfy various groups of stakeholders and not only shareholders. This demonstrates stakeholder principles are used daily by companies for supporting at least implicitly the achievement of corporate objectives.

Another descriptive justification stems from the demanding requests of institutions. Indeed, companies are increasingly called to provide guarantees to shareholders of financial returns in line with the level of risk which characterizes the business activities. At the same time also fair working and commercial conditions for employees, creditors, suppliers, customers as well as balanced benefits for local communities are requested (Orts, 1992). Policymakers are showing a growing interest in the legal and moral protection of companies' stakeholders. This results in empirical evidence of the changing attitude of companies towards stakeholders because they are triggered by institutions to adopt a stakeholder approach.

In line with Donaldson and Preston (1995), purely descriptive justifications do not provide a comprehensive justification for stakeholder theory. Although the concept of stakeholder is

implicit in the current legal trends, the adoption of the stakeholder management principles by companies cannot derive from a legal theory of stakeholder. In this perspective, the risk is to draw hasty generalizations since managers may abandon the stakeholder approach when regulation fails or gets weaker. Moreover, the descriptive perspective is based on empirical evidence concerning managerial practices, which can change over time depending on sectoral and market trends. This may link descriptive justifications to contingent circumstances and thus invalidates the underpinning theoretical constructs.

2.1.4. Instrumental justification to stakeholder theory

Instrumental justifications to stakeholder theory are based on the connection between stakeholder management and corporate performance. This constitutes a challenging topic in academic literature since the benefits of stakeholder management are hard to prove empirically. Several scholars have addressed this topic, including the pioneering empirical analysis conducted by Kotter and Heskett (1992), who emphasize the role of major stakeholders in the decision-making process, while investigating the main antecedents of corporate performance. However, empirical evidence about the impact of SRM practices on corporate performance is still fragmented and somewhat contradictory.

To overcome this limit, academics support instrumental justifications to stakeholder theory with the agency theory (Jensen and Meckling, 1976) and the firm-as-contract theory (Williamson and Winter, 1991). These two theories have in common the accent on efficiency. The agency theory argues companies aim to optimise their performance by minimising the costs incurred, including those generated by third parties. Hence, the theory suggests agents (i.e., company executives and managers) are expected to meet principals' requirements (i.e., shareholders) by reducing the emergence of higher expenditures. Hill and Jones (1992) try to broaden the standard paradigm of agency theory by integrating the concept of stakeholder. They develop the stakeholder-agency theory which considers corporate executives as the agents of both shareholders and stakeholders. The Authors claim stakeholders differ for relevance (i.e., stake or interest in the company) and power and thus their relationships with the agents vary over time. For this reason, the priority of corporate executives should be to monitor these changes, rather than to pursue a balance between contributions and remuneration as suggested by the previous traditional managerial approach for stakeholder management. The focal point of Hill and Jones' theory (1992) is given by the assumption that stakeholders cover a critical role in the achievement of corporate objectives and thus stakeholder management results instrumentally linked to corporate performance.

On the other hand, the firm-as-contract theory outlines the firm as a bundle of relationships regulated by contracts (Williamson and Winter, 1991). The firm can minimise the costs associated with the research of a partner and the coordination of activities. Moreover, it can reduce the uncertainty about the occurrence of potential risks, which usually generate extra costs. Freeman and Evan (1990) claim corporate performance depends on the management of contracts with stakeholders (e.g., employees, suppliers, customers, etc.). Each party involved shows a specific requirement and thus managers are called to harmonise all the interests to avoid conflicts. To this aim, Freeman and Evan (1990) also stress the importance of fair contracts for evenly distributing the benefits originating from the business. Therefore, firm-as-contract theory represents an instrumental justification to stakeholder theory since corporate performance are deeply affected by contractual relationships with stakeholders.

Although scholars tried to link the concept of stakeholder management to corporate performance, both the presented theories rely on not completely exhaustive argumentations. As concerns the stakeholder-agency theory of Hill and Jones (1992), it shows some shortcomings. First, managers should have opportunistic behaviours at the expense of stakeholders. Therefore, the Authors suggest the use of monitoring mechanisms to curb these events, but it still represents a risk that weakens the justification for the adoption of a stakeholder approach. Second, the success of stakeholder-agency theory requires the firm to shift from a managerial perspective focused on shareholders to a wider perspective that includes various stakeholders. According to Hill and Jones (1992), this shift of perspective represents a prerequisite to strengthening corporate performance. However, this condition involves more normative than instrumental considerations since the firm is called to meet stakeholders' requirements.

When it comes to firm-as-contract theory (Freeman and Evan, 1990; Williamson and Winter, 1991), the use of fair contracts to manage the relationships with stakeholders bring to light again the supremacy of normative issues over instrumental ones. Indeed, the Authors underline the importance of social contracts that are rooted in business ethics and respect for human rights. Consequently, social contracts concern more the normative sphere than the economic domain of formal contracts.

Given the above, stakeholder theory cannot be fully justified by the instrumental perspective, and it requires also normative considerations.

2.1.5. Normative justification to stakeholder theory

The normative perspective is the cornerstone of the stakeholder theory proposed by Freeman (1984). In the book "Strategic management: A stakeholder approach" (1984), Freeman underlines

the importance of moral principles to run the business, arguing they should be the foundations of corporate governance. This approach is not solely descriptive, nor explanatory of causal relationships, but rather it is focused on seeking attitudes and guidelines that meet the legal, moral and philosophical aspects of business management. Therefore, normative justifications to stakeholder theory ground on the strong connection between business management and relevant ethical considerations. The adoption of ethical and moral principles does not represent a limit, but conversely an opportunity to improve corporate performance and competitiveness (Freeman, 1984).

The incorporation of stakeholders' interests into the formulation and implementation of strategic plans distinguishes the stakeholder approach from other traditional managerial theories (Rusconi, 2012). Indeed, it is widely believed among scholars that what makes stakeholder theory unique among management theories is the attention paid to the moral foundations of business (Freeman et al. 2010). Accordingly, normative justifications address the reason why firms should consider stakeholders' interests in strategic planning, going beyond strategic issues and exploring the realm of philosophical foundations.

Various researchers have attempted to explain stakeholder theory through a broad range of philosophical and ethical considerations (Table 2.1). Evan and Freeman (1993) propose a stakeholder approach based on Kantian principles. They stress the importance of treating stakeholders as human beings rather than only as instrumental tools for seeking corporate goals. In this perspective, Phillips et al. (2003) claim stakeholder theory is not only a theory of organizational management but also a theory of ethics. This approach has been further developed in the 1990s, contrasting the traditional emphasis of managerial theories on instrumental purposes. Indeed, stakeholder theory is not limited to maximise the wealth of shareholders and it goes beyond the models of strategic management, such as resource dependence theory (Frooman 1999; Pfeffer and Salancik 1978). It aims to meet the interests and well-being of all salient stakeholders (not only shareholders) regardless of their role in the achievement of the organization's objectives (Phillips et al., 2003). Although all strategic management theories deal with some moral content, stakeholder theory addresses explicitly the interests of stakeholders by including them in the decision-making process. Thus, the normative perspective draws attention to the importance of stakeholder relationship management which became the focus of international academic debate on stakeholder theory. It suggests a new interpretation of corporate management which considers the firm as a bundle of relationships and interests instead of a standalone actor.

Table 2.1. Main normative justifications to stakeholder theory.

Author	Normative Core Topic
Argandona (1998)	*Common Good*
Wicks, Gilbert, and Freeman (1994) Burton and Dunn (1996)	*Feminist Ethics*
Clarkson (1994)	*Risk*
Donaldson and Dunfee (1999)	*Integrative Social Contracts Theory*
Donaldson and Preston (1995)	*Property Rights*
Evan and Freeman (1993)	*Kantianism*
Freeman (1994)	*The doctrine of Fair Contracts*
Phillips (1997, 2003)	*Principle of Stakeholder Fairness*

Source: Phillips et al. (2003)

Given the above considerations, normative justifications ground on two fundamental assumptions (Donaldson and Preston, 1995): first, stakeholders identify themselves according to their interest in the firm, and second, each stakeholder has an inherent value for the company regardless of its contribution to corporate performance. Therefore, the firm is expected to adopt suitable ethical and moral principles to handle the relationships with any individual or group with a legitimate interest in the activity. This has led Donaldson and Dunfee (1999) to develop a justification for stakeholder theory based on social contract theory, which combines the concept of fair distribution of social benefits arising from the business with the principles of SRM.

In conclusion, normative justifications to stakeholder theory are widely considered more exhaustive than previous descriptive and instrumental justifications. This perspective suggests relevant guiding principles for business and stakeholder management and thus it stands out from traditional managerial approaches.

2.2. The theoretical foundations of Stakeholder Relationship Management

2.2.1. The managerial perspective to stakeholder theory

The outstanding work of Donaldson and Preston (1995) outlines a fourth additional perspective to stakeholder theory, as they argue the stakeholder theory cannot be limited to descriptive,

instrumental, and normative purposes, being necessary to include an overarching managerial approach that combines the main aspects emerging from the three aforementioned perspectives.

Consistent with normative theory, the managerial perspective is based on the interests and expectations of legitimate stakeholders which are thus included in the strategic decision-making process by the firm. Also, the managerial perspective outlines behaviours, policies, organisational structures and managerial practices to deal with both internal and external stakeholders. These measures address any individual or group that affect or is affected by the business and thus represent the foundations of stakeholder management.

In the book "Strategic Management of Organisation and Stakeholder" (1994) Harrison and St John distinguished between stakeholder analysis and stakeholder management. They argued stakeholder management consists of an array of activities including communicating, negotiating, contracting, managing relationships and motivating stakeholders. This represents a profound change towards a managerial perspective based on collaborative behaviours and strategic partnerships (Freeman et al., 2010). In this perspective, ethics becomes a major factor of stakeholder management because it provides the principles and codes of behaviour to develop profitable relationships of trust.

Moreover, according to Harrison and St John (1994), the stakeholder approach represents an overarching framework that embraces several aspects of traditional managerial approaches. It assumes a strategic function to investigate the relationships with stakeholders such as competitors and suppliers likewise Porter's five forces model (Porter 1979). However, stakeholder management goes far beyond these analytical and descriptive purposes. It addresses the evaluation and prioritisation of stakeholders for their stake and economic or political power (Freeman et al., 2010). Stakeholder management outlines behaviours and practices to deal with stakeholders considering corporate ethical codes. Thus, the stakeholder approach aims to harmonise traditional strategic analysis and corporate objectives with the distinctive business values of the firm.

Although the managerial perspective to stakeholder theory is rooted in the first definition of stakeholder provided by the Stanford Research Institute (1963), at the beginning it received less attention than descriptive, instrumental and normative perspectives (Freeman and Velamuri, 2006). Then, scholars tried to develop an overarching stakeholder theory to overcome the gaps emerging from previous perspectives. One of the first attempts was carried out by Freeman (1984) who considered different aspects of each stakeholder perspective (e.g., changes within relationships, as defined in descriptive theory, and the responsibility of the firm to meet legitimate requirements of stakeholders, as reported in normative theory). A few years later, Clarkson (1991)

provided a managerial framework to describe, evaluate and manage corporate social performance leading the way to the principles of stakeholder management.

The relevant contributions of Freeman (1984) and Clarkson (1991) enabled stakeholder theory to emerge in the management academic literature. Since then, stakeholder management has represented an open and fascinating issue that still attract an increasing number of international scholars. The identification, classification and management of myriad groups of stakeholders, constitute a never-ending task that continuously involves multiple stakeholders' interests that must be integrated and balanced with corporate objectives as well as with other stakeholders' changing needs.

Among them, the identification of salient stakeholders is a critical aspect for organisations because of the increasing pressure of legitimate individuals and groups with an interest in the business. Indeed, the stakeholder management approach suggests companies broaden their objectives to satisfy a wide array of salient stakeholders (Buysse and Verbeke, 2003). Corporate objectives should not only address customer satisfaction and regulatory compliance but also social and environmental responsibility to meet the numerous and growing requirements of local communities and societal groups of interest (Buysse and Verbeke, 2003).

In line with the major academic contributions (see, e.g., Freeman 1984; Hill and Jones, 1992; Clarkson 1995; Donaldson and Preston, 1995), stakeholder management can be outlined in four fundamental activities, as follows:

i. identification and classification of (internal and external) stakeholders.

ii. evaluation of their ability/power to influence the corporate strategic objectives.

iii. prioritisation (or hierarchization) of relationships with stakeholders.

iv. management of the relationships with stakeholders and involvement of most influential stakeholders in the decision-making processes.

The identification and classification of the various stakeholders (i) and the evaluation of their potential influence on corporate activities (ii) require the definition of categories of stakeholders which include any group, individual and organization with an interest in the business (Clarkson, 1995). The categories must reflect the issues and themes of interest to stakeholders (Savage et al., 1991).

Stakeholder prioritisation (iii) represents one of the milestones and most challenging tasks of stakeholder management (Mitchell et al., 1997). It addresses the measurement of stakeholder groups' effective influence on corporate performance and image. Numerous authors have tried to

identify the logical and rational rules underlying the stakeholder hierarchy processes (Fassin, 2009; Mainardes et al., 2012). Amongst them, Mitchell et al. (1997) proposed a widely used conceptual framework that includes three attributes to order stakeholders, namely the power to influence the organization, legitimacy and urgency.

Finally, the management of the relationships established with the most salient and influential stakeholders (iv) leads the firm to actively monitor their interests and to include the emerging requirements in the decision-making processes and strategic actions.

2.2.1.1. Stakeholder identification: wide and narrow perspective

Academic literature has tried to define "stakeholder" in various ways, to capture the different dimensions in which the concept is articulated (Donaldson and Preston, 1995). In the early 1960s, the term "stakeholder" appeared for the first time within an internal memorandum of the Stanford Research Institute (1963): "s*takeholders are those groups without whose support the organization would cease to exist*". This definition stresses a one-way perspective because external parties support the organisation and non-vice versa. In his outstanding work "*Strategic management: A stakeholder approach*" (1984), Freeman overcame this approach and introduced a two-way perspective that has been widely used later: "*any group or individual who can affect or is affected by the achievement of the organization's objectives*".

Over the years, the definition of stakeholder has evolved in line with the emergence of stakeholder theory. Table 2.2 reports the main definitions of stakeholders according to their chronological appearance in literature.

Table 2.2. Main definitions of stakeholder.

Author	Year	Definition
Stanford Research Institute	1963	Stakeholders are those groups without whose support the organization would cease to exist.
Rhenman	1964	Stakeholders depend on the firm to achieve their personal goals and on whom the firm is depending for its existence.
Ahlstedt and Jahnukainen	1971	Driven by their personal goals and interests, stakeholders participate in a company, and thus they depend on it and whom for its sake the firm depends.
Freeman and Reed	1983	In a wide perspective, stakeholders can affect the achievement of an organization's objectives or who is affected by the achievement of an

		organization's objectives; in a narrow perspective, on which the organization is dependent for its continued survival.
Freeman	1984	The stakeholder can affect or is affected by the achievement of the organization's objectives.
Freeman and Gilbert	1987	Stakeholders can affect or is affected by a business.
Cornell and Shapiro	1987	“Claimants" who have "contracts".
Evan and Freeman	1988	Stakeholders have a stake in or claim on the firm. They benefit from or are harmed by, and whose rights are violated or respected by corporate actions.
Bowie	1988	Stakeholders are those without whose support the organisation would cease to exist.
Alkhafji	1989	Stakeholders are groups to whom the corporation is responsible.
Carroll	1989	A stakeholder asserts to have one or more stakes, ranging from an interest to a right (legal or moral) to ownership or legal title to the company's assets or property.
Freeman and Evan	1990	Stakeholders are contract holders.
Thompson, Wartick and Smith	1991	Stakeholders are those who have a relationship with an organization.
Savage, Nix, Whitehead, and Blair	1991	Stakeholders have an interest in the actions of an organisation, and they can influence it.
Hill and Jones	1992	Stakeholder constituents have a legitimate claim on the firm established through the existence of an exchange relationship. He provides the firm with critical resources (contributions) and in exchange each expects its interests to be satisfied (by inducements).
Brenner	1993	Stakeholders have some legitimate, non-trivial relationship with an organization (e.g., exchange transactions, action impacts, and moral responsibilities).
Carroll	1993	Stakeholder asserts to have one or more stakes in the business. He may be affected by or affect the business.
Freeman	1994	Stakeholders are participants in the human process of joint value creation.
Wicks, Gilbert and Freeman	1994	Stakeholders interact with and give meaning and definition to the corporation.
Langtry	1994	The firm is significantly responsible for stakeholders’ well-being, or they hold a moral or legal claim on the firm.

Starik	1994	Stakeholders can and are making their actual stakes known. They are or might be influenced by, or are or potentially are influencers of, some organization.
Clarkson	1994	Stakeholders bear some form of risk as a result of having invested some form of capital, human or financial, something of value, in a firm, or they are placed at risk as a result of a firm's activities.
Clarkson	1995	Stakeholders have or claim, ownership, rights, or interests in a corporation and its activities.
Naesi	1995	Stakeholders interact with the firm and thus make its operation possible.
Brenner	1995	Stakeholders are or which could impact or be impacted by the firm/organization.
Donaldson and Preston	1995	Stakeholders are persons or groups with legitimate interests in procedural and/or substantive aspects of corporate activity.

Source: Author's elaboration

The review in Table 2.2 brings to light two different perspectives to understand the nature of stakeholder: the wide and narrow sense of stakeholder.

According to the wide perspective, Freeman and Reed (1983) define stakeholders as "*any identifiable group or individual who can affect the achievement of an organization's objectives or who is affected by the achievement of an organization's objectives*". This definition extends the notion of "stake", and it refers to a wide array of individuals and groups, including public interest groups, protest groups, government agencies, trade associations, competitors, trade unions, as well as employees, customers and shareholders. The relationship that links the organisation to stakeholders can be unidirectional, in other words, it does not require a mutual exchange of resources or benefits between the parties involved, as it occurs for transactions and contracts.

The wide perspective of stakeholder is adopted by other prominent academics, such as Carroll (1989) "*Stakeholder asserts to have one or more stakes, ranging from an interest to a right (legal or moral) to ownership or legal title to the company's assets or property"*, Thompson et al. (1991) "*Those who have a relationship with an organization"*, Savage et al. (1991) "*Stakeholders have an interest in the actions of an organisation, and they can influence it*", and Brenner (1995) "*Stakeholders are, or which could impact or be impacted by the firm/organization".* This interpretation only excludes individuals and groups who cannot affect the company because they do not have enough power or legitimacy. Moreover, it excludes those who are not affected by the

company's activity because they do not have expectations or interests in corporate objectives and performance.

The extensive range of stakeholders involved in these wide definitions makes the identification of stakeholders and related requirements a very challenging task (Mitchell et al., 1997). Therefore, if on the one hand, the firm reduces the risk of not considering some relevant stakeholders, on the other hand, this approach requires a great effort to manage both information and relationships.

The narrow perspective is rooted in the definition of stakeholder provided by the Stanford Research Institute (1963), which outlines stakeholders as "*those groups without which the organization would cease to exist*". Then, other academics embracing this perspective claim "*stakeholders are any identifiable group or individual on which the organization is dependent for its continued survival"* (Freeman and Reed, 1983) and again "*those without whose support the organisation would cease to exist"* (Bowie, 1988). The narrow sense of stakeholder puts the accent on the critical role of stakeholders for the survival and success of the firm. The relationships with these individuals and groups are thus considered a key driver shaping and characterising the business (Mitchell et al., 1997).

Cornell and Shapiro (1987) and Freeman and Evan (1990) stress the contractual nature of the relationship with stakeholders. According to this narrow interpretation, Hill and Jones (1992) assert "s*takeholder constituents who have a legitimate claim on the firm, established through the existence of an exchange relationship. He provides the firm with critical resources (contributions) and in exchange each expects its interests to be satisfied (by inducements)*". What emerges is the two-way relationship between the firm and its stakeholders in terms of contributions requested to stakeholders versus benefits (or incentives) provided to them by the firm. These relationships are guaranteed by formal contracts that legitimate the interests of both parties. Therefore, the narrow perspective draws attention to the economic nature of stakeholder management.

Finally, Clarkson (1994) argues "s*takeholders bear some form of risk as a result of having invested some form of capital, human or financial, something of value, in a firm, or they are placed at risk as a result of a firm's activities"*. This definition goes beyond the mere contractual relationship, and it brings to light the moral responsibilities of the firm towards its stakeholders. It falls into the normative perspective of stakeholder theory which stresses the legal, moral and philosophical aspects of stakeholder management. In this regard, Donaldson and Preston (1995) state "*stakeholders are persons or groups with legitimate interests in procedural and/or substantive aspects of corporate activity".* The Authors also describe stakeholder management as corporate participation in creating and supporting the moral expectations of stakeholders. As a

result, the firm is called to fairly distribute the benefits and harms related to the business among all the stakeholders involved.

Both the wide and narrow definitions of stakeholders highlight the need for companies to identify the main influencing stakeholders and manage the relationships with them. These bonds, indeed, are widely considered critical for the survival and competitiveness of the firm and thus they require careful attention by the management. For this reason, firms are called to adopt managerial practices relating to stakeholder management to form, monitor and maintain constructive relationships with their stakeholders (Berman et al., 1999).

In the late 1990s, Rowley (1997) and Frooman (1999) proposed two similar frameworks for stakeholder identification and classification based on network theory. They went beyond both the wide and narrow perspectives and criticised the excessive focus of previous academic contributions on the influence of individual stakeholders on the organization as well as the dyadic relationships as described by Freeman (1984). Rowley (1997) argued each stakeholder simultaneously influences the organization and also the behaviour of all the other stakeholders respect to the organization itself. Although stakeholders are not all directly connected, a complex network of intertwining relationships exists. In the same way, Frooman (1999) sustained stakeholders may influence the organization directly or indirectly forming broad or narrow alliances.

To conclude, not every stakeholder requires the same attention. Therefore, the management is challenged to use specific criteria to classify and prioritise identified stakeholders for a suitable distribution of internal resources and efforts.

2.2.1.2. Stakeholder classification

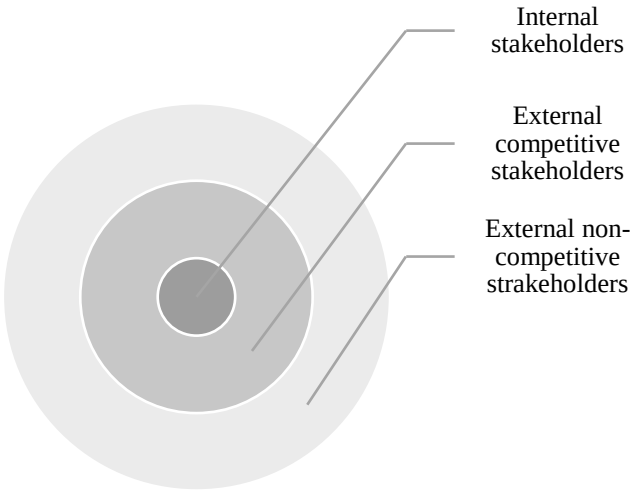
According to the well-known definition of stakeholder of Clarkson (1995), stakeholders are those who have expectations, stakes, rights or general interests in a company and its activities. These interests are the result of transactions and initiatives carried out by the company which generate legal or moral responsibilities towards individuals or groups. In line with the rights and expectations, stakeholders can be classified into different categories. Previous management studies provide various taxonomies to order stakeholders using traditional and more sophisticated approaches which also consider moral responsibilities and ethical issues.

Stakeholders are commonly classified into internal and external (Clarkson, 1991; Philips et al., 2003). Given the importance of external stakeholders (Harrison and John, 1996) they can be divided into two further categories according to their competitive or non-competitive nature. As

a result, a general classification of stakeholders may consist of the three following categories (Figure 2.4):

i. Internal stakeholders, which include the ownership, management and employees;
ii. External stakeholders belonging to the competitive environment (e.g., customers, suppliers, buyers, current and potential competitors);
iii. External stakeholders belonging to the social and political environment (e.g., institutions, communities, financial system, international bodies, associations).

Figure 2.4. Stakeholder classification.



Source: Author's elaboration

The first group (internal stakeholders) is composed of individuals with the power to influence corporate dynamics (Freeman and Reed, 1983; Harrison and St. John, 1994, 1996). Amongst them, the ownership provides the firm with the risk capital and other resources to run the business. For this reason, the owners have high interests and expectations to be satisfied. Their main objective is profit maximisation and thus they may behave opportunistically against the interests of other stakeholders (e.g., sale of the firm, layoff of employees, unethical and amoral decisions). In this perspective, the management is called to carefully handle the relationship with these prominent stakeholders without harming the interests of both internal and external stakeholders. The ownership can involve several individuals and groups, especially when the capital is fragmented into numerous shares. In this case, the power of shareholders and related interests come down due to the increasing number of investors. However, the ownership can be split into majority and minority shareholders. While the former can drive the strategic decisions of the

company and exercise a strong influence on the management, the latter has only a control and monitoring position which require less attention.

Internal stakeholders comprise also employees. Their interest in the business is related to the salary received in exchange for their work and performance. However, more and more firms are introducing social internal practices to increasingly involve and motivate employees to make them feel like an essential part of the business (Freeman et al., 2010). Indeed, academics stress the existence of a direct relationship between human resource management and labour performance, which heavily affect corporate profitability. In this perspective, better standards and working conditions are expected to stimulate employees and reward their efforts, feeding their interest in and commitment to the firm.

Although the managers are employees of the company, they are considered a stand-alone category of stakeholders because of the critical role held for the success and survival of the business (Freeman and Reed, 1983). The firm should constantly motivate managers and increase their sense of belonging to the company by the implementation of incentive and rewarding mechanisms. The position of the management as a stakeholder depends largely on corporate size, degree of business complexity, ownership structure and governance settings which can limit or foster the decision-making capacity of managers as well as their involvement in strategic planning.

The second macro-category of stakeholders is made of individuals and groups belonging to the competitive environment (Harrison and St. John, 1996). According to traditional management studies, including Porter's five forces model (1979), the analysis of the competitive environment brings to light customers, suppliers, current and potential competitors as the main external stakeholders. Each group has a specific interest in corporate activities. For instance, customers demand quality products and reliable services to satisfy their needs while suppliers aim to establish long-term relationships with the firm for achieving stable income and reducing the uncertainty as well as other costs. Particular attention is paid to the role of competitive stakeholders who affect corporate strategies since the firm is challenged to constantly achieve a superior competitive advantage over current and potential market competitors.

In line with the wide interpretation of stakeholder, the last category includes those stakeholders who influence or are influenced by corporate decisions, without affecting the survival of the company (Harrison and St. John, 1996). As a result, this category comprises also individuals and groups belonging to the public and social system. They pursue different objectives related to corporate activities which define the underlying reason for having a relationship with the company. For example, financial operators provide the organisation with capital to finance the

business. Therefore, they are interested in corporate performance for monitoring the credit risk related to financing. When it comes to public institutions, they outline the rules of the market and impose obligations and responsibilities to the firm. Indeed, the company must respect specific standards concerning governance settings and managerial aspects for being compliant with the law. For this reason, collaborative and stable dialogue with institutions is advisable to improve the understanding of regulation and to assist these stakeholders with policymaking.

Nowadays organisations are increasingly trying to strengthen the relationships with societal groups of interest (e.g., trade unions, associations of consumers, environmentalists, local communities, etc.). Indeed, the growing pressure of public opinion has led companies to face various issues concerning safety at work, polluting emissions and other externalities arising from their activities (Carroll, 2008). The emergence of these topics has expanded the array of stakeholders involved in corporate life, drawing the attention of the management to voluntary environmental, philanthropic and ethical initiatives aiming at meeting the requirements of these stakeholders and improving the competitiveness of the firm.

Beyond the above taxonomy of stakeholders (Figure 2.4), academic literature includes several different and more sophisticated attempts to order stakeholders (Table 2.3). Among them, voluntary versus involuntary, direct versus indirect, generic versus specific, normative versus derivative, core versus peripheral are widely used criteria by academics and practitioners.

Table 2.3. Main stakeholder classifications in literature.

Authors	Stakeholder classification criteria
Goodpaster (1991)	*Moral vs strategic*
Savage et al. (1991)	*Primary vs secondary*
Mahoney (1994)	*Active vs passive*
Clarkson (1995)	*Voluntary vs involuntary*
Rowley (1997)	*Network density and the centrality of the organization focus*
Scholes and Clutterbuck (1998)	*Power of influence, impact on the organization and affinity with organizational objectives*
Luoma and Goodstein (1999)	*Primary vs public*
Henriques and Sadorsky (1999)	*Organisational vs community vs regulatory vs media*
Friedman and Miles (2002)	*Necessary–contingent vs compatible–incompatible*

Sirgy (2002)	*Internal vs external*
Post et al. (2002)	*Resource-based vs industry structure-based vs socio-political-based*
Kaler (2002)	*Claimant vs influencer vs combinatory*
Phillips (2003)	*Normative vs derivative*
Hart and Sharma (2004)	*Core vs peripheral*
Kamann (2007)	*Power and the level of interest*
Fassin (2009)	*Stakeholders vs stake-watchers vs stake-keepers*
Sachs and Maurer (2009)	*Stakeholder position in the wealth creation process*
Vazquez-Brust et al. (2010)	*Institutional vs organisational vs social*
Mainardes et al. (2012)	*Regulator vs controller vs partner vs passive vs dependent vs non-stakeholder*

Source: author's elaboration on Philips et al. (2003), Mainardes et al. (2012) and Miles (2017).

One of the most famous classifications is provided by Savage et al. (1991) who distinguished between primary and secondary stakeholders. Primary stakeholders are those who have a direct impact on the firm and their continuous participation in the business is necessary for its survival. Generally, they have a formal official or contractual relationship with the organisation. This category typically includes shareholders, investors, employees, trade unions, customers, creditors and suppliers together with large institutional stakeholders (e.g., governments and public agencies), that provide infrastructures, markets, rules and regulations. If primary stakeholders' requirements are not satisfied, the company should be significantly damaged or be forced out of the business. In this perspective, the company's survival and lasting success depend on the ability of managers to create wealth, value and satisfaction for primary stakeholders.

On the other, secondary stakeholders are those who are not directly engaged in corporate economic activities, but they influence or are influenced by the company. In other words, they are not involved in contractual relationships and transactions and thus they are not essential for the survival of the business (Savage et al. 1991). However, the company should not underestimate secondary stakeholders because they may acquire the power to hamper the business. For example, protest campaigns of societal groups of interests or consumer interest groups may draw the attention of primary stakeholders and public opinion on specific issues concerning corporate governance or activities. This can heavily damage the image and reputation of the company,

reducing its competitiveness in the market. For this reason, the firm should also monitor the requirements of secondary stakeholders to prevent the occurrence of these problems.

2.2.1.3. Stakeholder prioritisation

Nowadays the firm is forced to deal with a wide array of stakeholders with different and conflicting interests. Therefore, the management is challenged to go beyond stakeholder classification and prioritise the interests of stakeholders to optimise the use of available resources.

The first stakeholder model including a broader spectrum of stakeholders and not only the traditional ones (i.e., clients, shareholders, employees, suppliers and competitors) was provided by Freeman (1984). The study raised a theoretical and practical question in the literature on how to deal with various stakeholders simultaneously without disappointing the expectations of some of them. Amongst other scholars, Fassin (2009) argues this is not a feasible goal because the firm does not have enough resources and capabilities to meet every stakeholders' needs. Thus, the management is called to adopt specific criteria to classy and prioritise stakeholders in line with the corporate strategic objectives and the available resources. In this perspective, the dilemma is to recognise the most valuable stakeholders for targeting correctly the managerial and operational efforts *(*Mainardes et al., 2012). Some groups of stakeholders involve a huge commitment due to their demanding requests, even though they do not cover a key role in business success neither survival.

The academic contribution of Savage et al. (1991) introduces two prominent attributes for stakeholder classification and prioritisation: power and legitimacy. Power is to what extent the stakeholder can influence the behaviour of the company. In other words, the stakeholder can force the management to decide that in normal circumstances it would not have done (Dahl, 1957). Etzioni et al. (1964) distinguish between coercive power (based on force, violence or pressure), utilitarian power (based on material or financial resources), and normative power. The latter is based on symbolic resources which consist of normative symbols (e.g., prestige and respect) or social symbols (e.g., love and acceptance). The achievement of power by stakeholders is transitory and thus it can be acquired or lost at any time. That means stakeholders may continuously change their power position towards the firm.

According to Suchman (1995), legitimacy is a "*generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions*". In this perspective, legitimacy is a desirable and common social value which is negotiated at different levels of the social system, including individual, organizational and corporate level (Wood, 1991). Although many scholars argue that

legitimate stakeholders are necessarily powerful stakeholders and vice versa, Savage et al. (1991) argue legitimacy and power are distinct attributes. Indeed, legitimate expectations arise from formal contracts, transactions, legal titles, moral interests, social values and beliefs while the ability to influence corporate decisions relies on the inherent characteristics of stakeholders and their social status.

Power and legitimacy are pivotal attributes for stakeholder prioritisation, but they do not capture the dynamics of the relationships between the firm and its stakeholders. To fill this gap, Mitchell et al. (1997) provided a new framework adding a third attribute, i.e., the urgency of the claim. The Authors describe urgency as the combination of time sensitivity (i.e., how urgent is the claim of the stakeholder) and criticality (i.e., the relevance of the claim and/or the relationship). This attribute assists the management in choosing which stakeholders must be satisfied first (i.e., stakeholder prioritisation).

Power, legitimacy and urgency represent the main attributes to describe the status of stakeholder. They are independent of each other, and the possession of the only attribute classifies an individual or a group as a stakeholder of the firm (Mitchell et al., 1997). On the other hand, overlaps may occur, and the combination of these three attributes outlines different categories of stakeholders which show specific expectations and requirements towards the company.

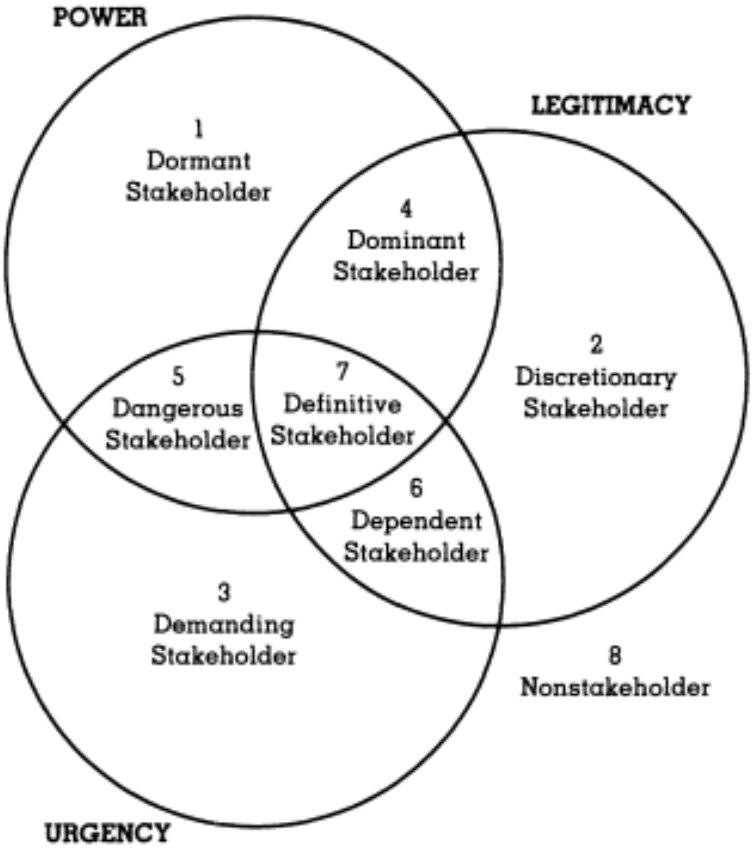
In line with previous considerations, stakeholder prioritisation is a dynamic process: power, legitimacy and urgency are not fixed attributes, and they vary over time, altering the relationship with the organization. Moreover, each attribute is the result of a non-objective perception which depends on the skills of the management and the specific circumstances when investigating. Finally, individuals or groups may not be aware of the possession of the attributes that qualify them as stakeholders. This may affect their behaviour towards the organization and vice versa, causing a loss of opportunities for both parties.

Although these criticalities and limits, the framework provided by Mitchell et al. (1997) is widely considered a valuable tool for organisations to investigate the relationships with current or potential stakeholders.

The framework (Figure 2.5) outlines eight types of stakeholders based on the possession of one, two or three of the attributes (i.e., power, legitimacy and urgency). The relevance of the stakeholder is a proxy of the number of attributes: the higher is the number and the higher is the priority it receives from the firm. In this perspective, Mitchel et al. (1997) define “latent stakeholders” as those having only one attribute (i.e., dormant, discretionary, and demanding stakeholders), “expectant stakeholders” those having two attributes (i.e., dominant, dependent

and dangerous stakeholders), “definitive stakeholders” those having all three attributes, and, finally “non-stakeholders” or “potential stakeholders” those not having any attributes.

Figure 2.5. Framework: stakeholder typologies according to their attributes.



Source: Mitchell et al., 1997

The level of the salience of latent stakeholders is rather low. For this reason, in some circumstances, the management may not recognise (or voluntarily do not recognise) individuals or groups as stakeholders. Mithcell et al. (1997) define dormant stakeholders as those having the power to influence the company, without the legitimacy and the urgency to exercise it. This results in few or no interactions between these stakeholders and the firm that does not get too concerned with their interests. However, the management should always monitor dormant stakeholders because of their potential impact on the business in case they acquire a second attribute. For example, dismissed employees are dormant stakeholders. They can exercise their power through violent strikes or demonstrations (i.e., coercive power), request of cancellation of unlawful dismissal in the court system (i.e., utilitarian power) or negative publicity (i.e., symbolic power).

The second category of latent stakeholders is discretionary stakeholders who own the only legitimacy. Due to the lack of power and urgency, managers do not have an active relationship with these stakeholders. Discretionary stakeholders represent an interesting topic for scholars dealing with corporate social responsibility because they are particularly sensitive to the company's CSR practices, especially concerning corporate philanthropy (Carroll, 1991). Nonprofits entities, such as schools and hospitals, are an example of discretionary stakeholders. Indeed, they may receive donations and voluntary work from private companies which aim to strengthen their CSR profile and corporate image.

The last category is demanding stakeholders. These stakeholders may give rise to challenging issues for the company. Demonstrators are a clear example of demanding stakeholders. Their expectations are irrelevant for the company until they get the attention of institutions, acquiring legitimacy, or turn into violent demonstrators, acquiring power.

Expectant stakeholders own two out of the three attributes (Table 2.4). They are a challenging group to manage because having expectations that must be satisfied and not ignored or only monitored by the firm. Consequently, the management is particularly involved in handling the relationship with dominant, dependent and dangerous stakeholders.

Dominant stakeholders have the power to influence the company and legitimate expectations to be met. Some clear examples are:

i. the board of directors, which is usually composed of representatives of owners, prominent creditors and community leaders;
ii. the financial office that manages the relationships and contracts with investors, creditors and debtors;
iii. the human resource department, which deals with employees;
iv. the office of public affairs, which aims to maintain good relations with public entities and community;
v. etc.

Each one of the previous examples stresses the use of formal mechanisms legitimising dominant stakeholders to make requests to the company. This leads firms and organizations to produce internal reports to prioritise the main powerful and legitimate dominant stakeholders as well as to correctly allocate the resources to handle the relationship with them, including operating budget, social and environmental budgets.

Table 2.4. Stakeholder prioritisation by their attributes.

Stakeholder type and level of priority	Categories
Latent stakeholders: only one attribute, low consideration.	***Dormant stakeholder***. Groups and individuals with the power to influence the behaviour of the firm. Although the management must monitor these stakeholders, the lack of legitimacy and urgency reduce the number of interactions with the company.
	Discretionary stakeholder. Groups and individuals with legitimacy. They are relevant for firms involved in corporate social responsibility issues and strategies.
	Demanding stakeholder. Groups and individuals with urgency. They may be critical stakeholders when gaining a second attribute.
Expectant stakeholders: two attributes, medium consideration.	***Dominant stakeholder***. Groups and individuals with power and legitimacy. They affect corporate behaviour and have legitimate expectations to be satisfied, but with no urgency. They require a lot of attention from the company.
	Dangerous stakeholder. Groups and individuals with power and urgency but stripped of any legitimacy. Those who exercise coercive power may be a threat to the organization
	Dependent stakeholder. Groups and individuals with legitimacy and urgency. Since they do not have power, they depend on another stakeholder for their claims to be met.
Definitive stakeholder: all three attributes, high consideration. The management is called to pay immediate attention and to prioritise these stakeholders, who are pivotal for corporate success and survival.	
Non-stakeholder: no attributes, no consideration. Groups and individuals who do not hold any influence and nor are influenced by the firm.	

Source: Author's elaboration on Mitchell et al. (1997)

While dependent stakeholders must depend on other powerful stakeholders to have their legitimate expectations be satisfied, dangerous stakeholders can use their coercive power to obtain what they pursue. For this reason, they represent a continuous threat to the company. Wild strikes, sabotages, acts of terrorism are some examples of the use of coercive power. These actions not only are out of legitimacy but also mine their relationship with the company.

Finally, definitive stakeholders are those who have power, legitimacy and urgency. Any stakeholder can become a definitive stakeholder by acquiring one of the missing attributes. In many cases, they are dominant stakeholders, characterised by power and legitimacy, who have acquired the attribute of urgency and have become the priority for the management. For example, major shareholders of big companies (i.e., dominant stakeholders), may use their power and legitimacy to claim against the company when managers do not recognise the urgency of their requests.

The theoretical framework provided by Mitchell et al. (1997) stresses the importance of moving beyond the traditional attribute of legitimacy and also including power and urgency when prioritising stakeholders. This theoretical approach can empirically support managers with understanding which stakeholders do really count. Besides, they should never forget that stakeholders change in salience according to the dynamism of the business competitive environment. This requires different attentions to primary stakeholders which vary according to the actual number and level of attributes they own.

Clarkson (1995) argues that "*the survival and continuing profitability of the corporation depends upon its ability to fulfil its economic and social purpose, which is to create and distribute wealth or value sufficient to ensure that each primary stakeholder group continues as part of the corporation's stakeholder system*". In this perspective, the ability of managers to handle relationships with primary stakeholders constitute pivotal intangible and complex resources that may critically affect the firm's performance and competitiveness in the long run (Hillman and Keim, 2001).

2.2.2. The Principles of Stakeholder Management

The role of managers within the stakeholder framework is contradictory in the literature. In the early 1980s, managers were not considered as the firm's stakeholders, but only intermediaries between shareholders and employees (Aoki, 1984). Then, Williamson (1985) recognises their influential role within the company and argues they may have opportunistic behaviours aimed to increase their power. According to this definition, Hill and Jones (1992), claim managers are the only group that enters into a contractual relationship with all stakeholders and thus they can

exercise direct control over the company's decision-making process. This suggests managers are pivotal to harmonize all diverging stakeholders' interests. Based on their competencies and perceptions, managers are also called to determine which groups of stakeholders are relevant to the company's objectives and thus which deserve the attention of the company.

Between 1993 and 1998, four international conferences were hosted by the Clarkson Centre for Business Ethics & Board Effectiveness Management which invited prominent management scholars to debate on stakeholder theory and the purposes of stakeholder management. As a result, in 1999 the Clarkson Centre published the "Principles of stakeholder management" which aims to draw the guidelines for how managers should manage their stakeholders. This remarkable contribution was later named "The Clarkson Principles of Stakeholder Management" in honour of Max Clarkson, one of the fathers of stakeholder management.

The manuscript argues managers cover a critical role within the company. They are indeed responsible for negotiating contracts with the company's stakeholders and creating a cooperative network. They carry out this challenging task by distributing costs and benefits deriving from the company's activities among all groups of stakeholders. In this perspective, managers have legal duties towards the company and moral responsibilities towards its stakeholders, whether they have explicit contracts (e.g., shareholders and employees), implicit contracts (e.g., customers), or non-contractual interests. This last case refers to when stakeholders are unaware of their relationship with the company until a specific event occurs that draws their attention. The impacts originating from these events are called externalities; for instance, environmental or economic damages caused to communities by the company's activities and practices.

Table 2.5 reports the seven Principles of Stakeholder Management (Clarkson Centre, 1999). They outline the legal obligations and moral responsibilities of managers towards stakeholders. Moreover, these principles stress the need to involve stakeholders in decision-making processes to pursue long-term sustainable objectives and create added value.

The first principle draws attention to the existence of various groups of stakeholders and related interests which must be involved in the decision-making process by the management. Some of these stakeholders (e.g., investors, employees, customers) are easily recognisable from implicit or explicit contractual relationships. On the other hand, some stakeholders can be identified according to the positive or negative impacts that a company's activities generate on their well-being. Finally, some third parties may claim a stake in the company. In this case, managers are challenged to examine carefully their expectations, before considering the theme as legitimate stakeholders.

Principle 2 suggests managers create a dialogue with stakeholders aimed to strengthen cooperation. In this perspective, managers can understand the main concerns of stakeholders and try to meet their requirements. Consequently, the more managers are open on certain critical issues, the more transparent and clearer is the relationships, and thus the higher is the likelihood of satisfying stakeholders.

Table 2.5. The Seven Clarkson Principles of Stakeholder Management.

Principle 1	*Managers should acknowledge and actively monitor the concerns of all legitimate stakeholders and should take their interests appropriately into account in decision making and operations*
Principle 2	*Managers should listen to and openly communicate with stakeholders about their respective concerns and contributions, and about the risks that they assume because of their involvement with the corporation*
Principle 3	*Managers should adopt processes and modes of behaviour that are sensitive to the concerns and capabilities of each stakeholder constituency*
Principle 4	*Managers should recognize the interdependence of efforts and rewards among stakeholders and should attempt to achieve a fair distribution of the benefits and burdens of corporate activity among them, taking into account their respective risks and vulnerabilities*
Principle 5	*Managers should work cooperatively with other entities, both public and private, to ensure that risks and harms arising from corporate activities are minimized and, where they cannot be avoided, appropriately compensated*
Principle 6	*Managers should avoid altogether activities that might jeopardize inalienable human rights (e.g., the right to life) or give rise to risks which, if clearly understood, would be patently unacceptable to relevant stakeholders*
Principle 7	*Managers should acknowledge the potential conflicts between (a) their role as corporate stakeholders, and (b) their legal and moral responsibilities for the interests of stakeholders, and should address such conflicts through open communication, appropriate reporting and incentive systems and, where necessary, third party review.*

Source: Clarkson Centre for Business Ethics & Board Effectiveness Management (1999).

Stakeholder groups differ not only for their primary interests but also for dimension, the complexity of needs and level of involvement in the company. Some relationships can be managed through formal mechanisms prescribed by regulation, such as collective agreements,

shareholder meetings or official procedures, while others require public relations and personal contacts. Relatedly, in line with Principle 3, the opportunities for dialogue and the options for information exchange vary according to the characteristics of stakeholders.

An organization involves several stakeholders that voluntary work together for mutual benefits. However, there are also involuntary or indirect stakeholders (e.g., communities) that may be affected by the company's activities. In this vein, Principle 4 argues managers should be able to guarantee a fair distribution of benefits and burdens as well as to avoid exposing some stakeholders to greater risks than what they are willing to accept. Once again, transparency and fairness constitute a pillar of stakeholder management.

In certain circumstances, companies' activities generate consequences that may not be completely mediated by the market. For this reason, managers are called to monitor and prevent the rise of negative externalities, especially caused to non-contractual stakeholders (e.g., communities). In this perspective, Principle 5 suggests managers look for collaborations with private companies, public agencies, and governments to enter into agreements with relevant groups for reducing harmful impacts and compensate damaged parties.

Clarkson Principles of Stakeholder Management argue managers are called to inform stakeholders of the risks related to the company's activity. As reported in Principles 4 and 5, they are called to negotiate ad hoc contracts for fairly distribute burdens, damages, and benefits. However, some projects may have dramatic consequences for which no compensations exist. To this purpose, managers must review corporate activities to avoid the arising of unacceptable consequences (Principle 6). In specific cases, managers should be also called to abandon a project.

As previously mentioned, managers are stakeholders with access to sensitive information and thus they can significantly influence the decision-making process of the company. For this reason, the board of directors along with shareholders should align the interests of the company and other stakeholders with the interests of managers. Tensions are inevitable since managers have specific requirements as the other groups of stakeholders. However, Principle 7 highlights managers still have legal and moral responsibilities towards the interests of the company's stakeholders which must be avoided. Then, managers should increase their credibility to foster their position as well as to smooth such conflicts. In this perspective, Clarkson Stakeholder Management Principles suggest using transparent communication, appropriate reporting and incentive systems.

2.3. Corporate Social Responsibility for managing stakeholders

2.3.1. The evolving concept of CSR

Corporate Social Responsibility (CSR) is a managerial theory that was developed in parallel with the concept of stakeholder management. The academic literature does not provide a uniform or commonly accepted definition of CSR which still represents an evolving theory. For this reason, the section provides an analysis of the evolution of CSR, bringing to light principal authors and contributions that have addressed this topic (Table 2.6).

Table 2.6. The principal academic definition of CSR.

Author	Year	Definition of CSR
Bowen	1953	*The obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society.*
Davis	1960	*Businessmen's decisions and actions taken for reasons at least partially beyond the firm's direct economic or technical interest*
Frederick	1960	*Social responsibilities mean that businessmen should oversee the operation of an economic system that fulfils the expectations of the public. And this means in turn that the economy's means of production should be employed in such a way that production and distribution should enhance total socio-economic welfare. Social responsibility, in the final analysis, implies a public posture toward society's economic and human resources and a willingness to see that those resources are used for broad social ends and not simply for the narrowly circumscribed interests of private persons and firms.*
Friedman	1962	*There is one and only one social responsibility of business—to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud.*
McGuire	1963	*The idea of social responsibilities supposes that the corporation has not only economic and legal obligations but also certain responsibilities to society that extend beyond these obligations*
Davis and Blomstrom	1966	*Social responsibility, therefore, refers to a person's obligation to consider the effects of his decisions and actions on the whole social system. Businessmen apply social responsibility when they consider the needs and interest of others who may be affected by business actions. In so doing, they look beyond their firm's narrow economic and technical interests*
Davis	1967	*The substance of social responsibility arises from a concern for the ethical consequences of one's acts as they might affect the interests of others.*
Walton	1967	*The new concept of social responsibility recognizes the intimacy of the relationships between the corporation and society and realizes that such relationships must be kept in mind by top managers as the corporation and the related groups pursue their respective goals.*
Johnson	1971	*Social responsibility in business is the pursuit of socioeconomic goals through the elaboration of social norms in prescribed business roles; or, to put it more simply, business takes place within a socio-cultural system that outlines through norms and business roles particular ways of responding to particular situations and sets out in some detail the prescribed ways of conducting business affairs*

Steiner	1971	*The assumption of social responsibilities is more of an attitude, of the way a manager approaches his decision-making task than a great shift in the economics of decision making. It is a philosophy that looks at the social interest and the enlightened self-interest of business over the long run as compared with the old, narrow, unrestrained short-run self-interest.*
Davis	1973	*For purposes of this discussion CSR refers to the firm's consideration of, and response to, issues beyond the narrow economic, technical, and legal requirements of the firm. It is the firm's obligation to evaluate in its decision-making process the effects of its decisions on the external social system in a manner that will accomplish social benefits along with the traditional economic gains which the firm seeks. It means that social responsibility begins where the law ends. A firm is not being socially responsible if it merely complies with the minimum requirements of the law, because this is what any good citizen would do.*
Eells and Walton	1974	*In its broadest sense, corporate social responsibility represents a concern with the needs and goals of society which goes beyond the merely economic. Insofar as the business system as it exists today can only survive in an effectively functioning free society, the corporate social responsibility movement represents a broad concern with business's role in supporting and improving that social order.*
Backman	1975	*Employment of minority groups, reduction in pollution, greater participation in programs to improve the community, improved medical care, improved industrial health and safety—these and other programs designed to improve the quality of life are covered by the broad umbrella of social responsibility*
Sethi	1975	*Social responsibility implies bringing corporate behaviour up to a level where it is congruent with the prevailing social norms, values, and expectations of performance.*
Votaw	1973	*The term [social responsibility] is a brilliant one; it means something, but not always the same thing, to everybody. To some it conveys the idea of legal responsibility or liability; to others, it means socially responsible behaviour in an ethical sense; to still others, the meaning transmitted is that of "responsible for," in a causal mode; many simply equate it with a charitable contribution; some take it to mean socially conscious; many of those who embrace it most fervently see it as a mere synonym for "legitimacy," in the context of "belonging" or being proper or valid; a few see it as a sort of fiduciary duty imposing higher standards of behaviour on businessmen than on citizens at large.*
Fitch	1976	*Corporate social responsibility is defined as the serious attempt to solve social problems caused wholly or in part by the corporation.*
Carroll	1979	*The social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time.*
Jones	1980	*Corporate social responsibility is the notion that corporations have an obligation to constituent groups in society other than stockholders and beyond that prescribed by law and union contract. Two facets of this definition are critical. First, the obligation must be voluntarily adopted; behaviour influenced by the coercive forces of law or union contract is not voluntary. Second, the obligation is a broad one, extending beyond the traditional duty to shareholders to other societal groups such as customers, employees, suppliers, and neighbouring communities.*
Carroll	1983	*CSR involves the conduct of a business so that it is economically profitable, law-abiding, ethical and socially supportive. To be socially responsible [...] then means that profitability and obedience to the law are foremost conditions to discussing the firm's ethics and the extent to which it supports the society in which it exists with contributions of money, time and talent.*

		Thus, CSR is composed of four parts: economic, legal, ethical and voluntary or philanthropic
Epstein	1987	*Corporate social responsibility relates primarily to achieving outcomes from organizational decisions concerning specific issues or problems which (by some normative standard) have beneficial rather than adverse effects on pertinent corporate stakeholders. The normative correctness of the products of corporate action has been the main focus of corporate social responsibility.*
Carroll	1991	*The CSR firm should strive to make a profit, obey the law, be ethical, and be a good corporate citizen.*
Hopkins	1998	*Corporate social responsibility is concerned with treating the stakeholders of the firm ethically or in a socially responsible manner. Stakeholders exist both within a firm and outside. Consequently, behaving socially responsibly will increase the human development of stakeholders both within and outside the corporation.*

Source: Author's elaboration

Although the initial resistance, CSR drew the attention of international scholars after the publication of the book "Social responsibilities of the businessman" in 1953 by Bowen, who is still considered the father of CSR. Bowen described social responsibilities as "*obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society*" (Bowen, 1953). Later, Davis (1960) defined social responsibility as "*businessmen's decisions and actions taken for reasons at least partially beyond the firm's direct economic or technical interest*".

In the beginning, the Authors involved in CSR theory and issues received several criticisms, especially between the 1960s and the 1970s. The most famous antagonist of this school of thought is Friedman, one of the most famous economists of the 20th century, who compared social responsibility to "hypocritical window dressing" (Friedman, 1970). He claimed the only responsibility of the firm is to maximise profits to satisfy shareholders. In this perspective, Friedman defined CSR as "Stockholder Theory" because no ethical or moral responsibilities should concern the management except economic ones. This approach was later considered too simplistic and outdated by academics which, conversely, supported the growing CSR theory.

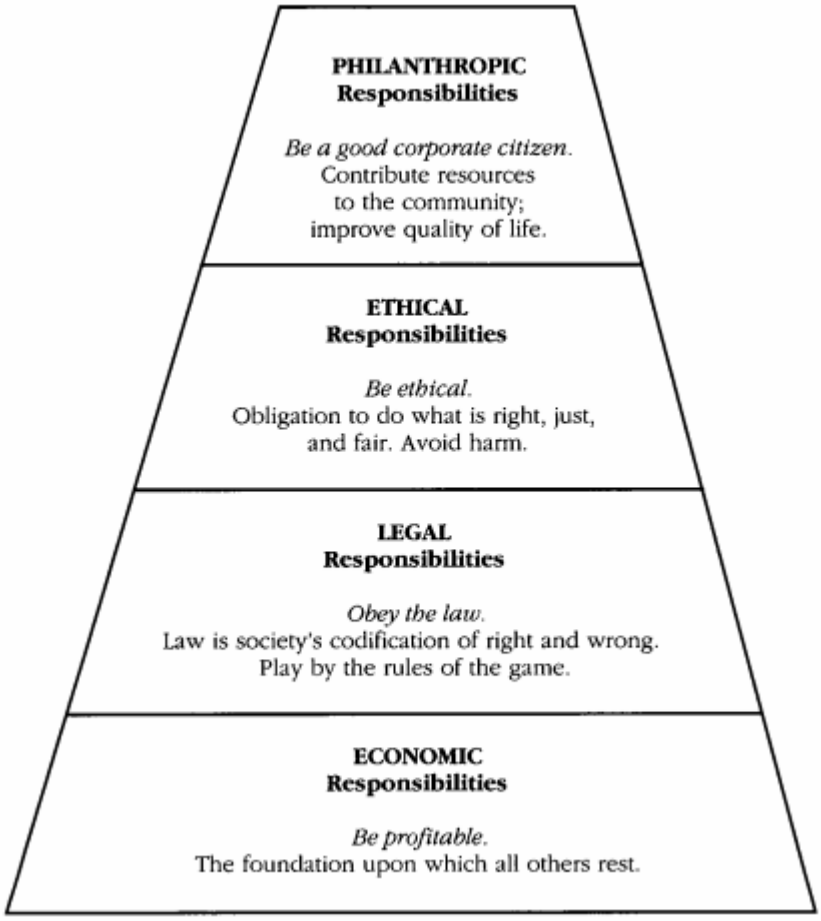
In the early 1970s the establishment of new government bodies by the USA, such as the Environment Protection Agency, the Equal Employment Opportunity Commission, the Occupational Safety and Health Administration and the Consumer Product Safety Commission, made it clear that public policy officially recognized environment, employees and consumers as legitimate stakeholders of the company, putting the CSR concept in the limelight (Carroll, 1991). From that moment on, managers of USA companies were involved in harmonising corporate economic and legal objectives with ethical and moral obligations towards a larger array of stakeholders.

In 1971 the Committee for Economic Development (CED) proposed an innovative model to analyse the economic and non-economic concerns of the firm. The "three concentric circles" approach is made of three levels of responsibilities sorted by relevance. The inner circle includes basic responsibilities about corporate economic functions. The intermediate circle reports the responsibilities arising from the course of the business (e.g., environmental conservation, hiring, and relations with employees, etc.). Finally, the outer circle outlines the emerging responsibilities of the firm regarding social issues.

Although the previous valuable academic contributions and the growing government initiatives, the first author to explicitly address the concept of corporate social responsibility is Sethi (1975). He provided an analytical framework to assess corporate social performance, making a distinction between social obligations, social responsibilities, and social responsiveness. In line with this work, Carroll (1979) developed a three-dimensional conceptual model of corporate performance which was rapidly adopted by several authors. The proposed model aims to disentangle the CSR concept by investigating the main social issues that organizations are called to address as well as the company's responsiveness to social issues. Moreover, Carroll defines CSR as "*the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time*" (Carroll 1979). The Author argues CSR involves running the business in an economically profitable, law-abiding, ethical and social way. He stresses profitability and compliance with the law are the foremost conditions for the firm before addressing ethical and philanthropic issues. In this regard, CSR consists of four responsibilities: economic, legal, ethical and voluntary or philanthropic (Carroll, 1979).

The harmonization of these four aspects, especially the combination of economic and social responsibilities, remained an open issue until 1991 when Carroll depicted the Pyramid of Corporate Social Responsibility. The well-known pyramid metaphor (Carroll, 1991) is made of four levels in the following order: economic, legal, ethical and, finally on the top, philanthropic responsibilities (Figure 2.6). Economic components are the foundations of the pyramid. The firm represents the basic economic unit in our society and thus it has the responsibility to provide goods and services required by the economic system (Carroll, 1979). On the other hand, profitability is pivotal for the survival and success of the business. For this reason, before dealing with the other responsibilities of the pyramid, the firm is called to perform in a manner consistent with maximising earnings and operating efficiently to achieve and maintain a strong competitive position. At the second level of the pyramid, there are legal responsibilities. Society expects the firm to be a good law-abiding corporate citizen for running the business. In this perspective, goods and services provided must comply with at least minimal legal requirements established by state and local regulations.

Figure 2.6. Pyramid of Corporate Social Responsibility.



Source: Carroll, 1991.

While the first two levels of the pyramid are mandatory to carry out the business, ethical and philanthropic components are voluntary. Ethical responsibilities are ill-defined and thus challenging for the management to deal with (Carroll, 1979). They concern expectations of society about the business which go beyond legal requirements. In other words, they are corporate activities and practices required by society, even though they are not compulsory by-laws and regulations. Consequently, the firm is called to adopt rules of conduct and ethical norms aimed to meet and respect stakeholders' moral rights. These measures address environmental protection, civil rights and, in general, societal values to produce higher standards of living and improve the quality of life of stakeholders. Given the growing attention of society on these topics, ethical responsibilities have become a driving force behind the creation of laws and regulations (Carroll, 1991). In another sense, they may be interpreted as newly emerging societal values that will be converted to a standard of corporate performance established by law. Therefore, the firm should

recognise and respect ethical responsibilities to ward off the occurrence of causes that may compromise its strategic objectives.

Finally, philanthropic responsibilities characterise good corporate citizens (Carroll, 1979; 1991). They promote charitable activities within local communities, assistance to private and public education institutions, programs for performing arts and any projects aiming at enhancing the quality of life and well-being of stakeholders, especially the community. What distinguishes philanthropic responsibilities from ethical ones is their voluntary and discretionary nature since they are not expected by society in both ethical and moral sense (Carroll, 1991). In other words, stakeholders desire the firm to use money, facilities and employees for philanthropic initiatives and humanitarian projects, but they do not judge the firm as unethical if it does not carry out these purposes.

The Pyramid of Corporate Social Responsibility clarifies that CSR does not only mean corporate philanthropic behaviours. Indeed, Carroll (1991) argues philanthropy represents the "icing on the cake" and it is less important than the other three layers of the pyramid which are the main components of CSR. Moreover, the Author stresses responsibilities constantly change over time, especially ethical ones, and thus they just reflect the expectations of society at a given point in time. For this reason, the management is called to listen to stakeholders' requests, as suggested by stakeholder theory, but also to monitor changing regulations and societal values which affect the social responsibilities of the firm.

Due to the criticisms received, Schwartz and Carroll (2003) reduced the number of CSR categories (i.e., economic, legal and ethical), incorporating philanthropic responsibilities into ethical ones. Moreover, the Authors claim managers should develop actions, initiatives and programmes which meet simultaneously all the three categories of responsibilities. This is a clear reference to stakeholder theory debated in the previous sections since CSR strategies aim to satisfy all stakeholders' requirements and interests. The concept of CSR is addressed by Freeman (1984) in the stakeholder theory. He claims managers should consider all identifiable parties having an interest in the corporation when facing the decision-making process, including social interests. In this perspective, Hopkins (1998) states "*Corporate social responsibility is concerned with treating the stakeholders of the firm ethically or in a socially responsible manner. Stakeholders exist both within a firm and outside. Consequently, behaving socially responsibly will increase the human development of stakeholders both within and outside the corporation*" (Hopkins, 1998). Consequently, CSR demonstrates to be deeply rooted in stakeholder theory since the main goal pursued is to meet stakeholders' requirements in a socially responsible manner.

Another high-value contribution to CSR theory comes from the concept of the triple bottom line (TBL) developed by Elkington in 1994. According to TBL, corporations should address equally economic, environmental and social values. This means that what benefits the environment and society also positively affects business performance. Therefore, the adoption of TBL principles can foster the CSR practices of the company. However, some scholars (see e.g., McWilliams et al. 2016) argue that not all the objectives of TBL are equally important for companies, stressing some differences with CSR strategies. Indeed, Carroll's Pyramid of CSR puts economic responsibilities at the foundation of the model to underline that ethical and philanthropical goals, even if desirable, are still less important than economic performance.

In the early 2000s, empirical research took over theoretical knowledge, involving increasingly corporations and universities in research activities (Carroll, 2008). Furthermore, CSR got growing political attention as evidenced by the Green Paper regarding CSR of European Commission (2001), which reports "*Most definitions of corporate social responsibility describe it as a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis*" (European Commission, 2001). Since then, the concept of CSR has kept evolving and so its definitions. Several contributions have recently addressed the review of stakeholder and CSR literature since the 1950s to provide a comprehensive definition of the concept, including the outstanding work of Carroll (2008). In this perspective, in 2011, the European Commission issued "A renewed EU strategy 2011-14 for Corporate Social Responsibility" providing a modern and overarching interpretation of CSR, that is: "*the responsibility of enterprises for their impacts on society. Respect for applicable legislation, and for collective agreements between social partners, is a prerequisite for meeting that responsibility. To fully meet their corporate social responsibility, enterprises should have in place a process to integrate social, environmental, ethical, human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders, with the aim of maximising the creation of shared value for their owners/shareholders and for their other stakeholders and society at large; identifying, preventing and mitigating their possible adverse impacts*" (European Commission, 2011). Moreover, the EU Directive 2014/95 also called the Non-Financial Reporting Directive (NFRD) lays down the foundations for disclosure of non-financial and diversity information by certain large companies. Therefore, EU large companies are currently called to publish information related to environmental and social matters, treatment of employees, respect for human rights, anti-corruption and bribery, diversity on company boards in terms of age, gender, educational and professional background. This Directive helps civil society, policy makers, investors, and other stakeholders to evaluate the non-financial

performance of large European companies, encouraging them to develop a more responsible and sustainable approach to business.

What emerges from both academic studies, normative directives, and business practices is CSR goes far beyond the full compliance with the law and it consists of voluntary practices aimed to meet social environmental and ethical issues related to companies' stakeholders.

2.3.2. CSR from the managerial perspective

Most CSR definitions have the same shortcoming: they do not address how to put CSR into practice and thus how companies should cope with the challenges described in theory (Dahlsrud, 2008). The risk is CSR to be limited in the theoretical sphere without any empirical application. The central puzzle is how to reconcile the notion of CSR and related social principles with the economic objectives pursued by the firm. Indeed, CSR practices generate costs without direct financial profits in return. Besides, CSR benefits are hard to recognise and measure. Therefore, the management is called to use wisely the available resources to optimise the efforts required for CSR strategy.

One of the most challenging issues is to identify and prioritise deserving stakeholders among the myriad of individuals and groups with a stake or an interest in the business. As explained for stakeholder theory, academics have provided several criteria to classify stakeholders, including their attributes of power, legitimacy and urgency (Mitchell et al., 1997). While power is decisive from the management efficiency perspective, legitimacy defines the extent to which an individual or a group has a justifiable right to make a claim and thus it is pivotal from the CSR perspective. According to this assumption, Carroll (1991) argues that CSR defines which corporate social responsibilities (economic, legal, ethical, and philanthropic) the firm has toward its stakeholders. As widely explained in the present PhD thesis, stakeholder management aims to harmonise corporate strategic and economic objectives with the claims and interests of various stakeholders to strengthen corporate performance and competitiveness. Therefore, CSR is considered a prominent tool for managing legitimate stakeholders and related requirements. In another sense, the managerial function of CSR is to analyse, understand and classify the legitimate requirements of stakeholders, which are those interests perceived as proper or appropriate within the social system of norms, values, beliefs and rules (Suchman, 1995). To this purpose, organizations are expected to go beyond the principles and practices of stakeholder theory, addressing the social responsibilities towards stakeholders. Organisations are called to outline the most suitable strategy to make the best deal with economic, legal, ethical and philanthropic responsibilities.

Table 2.7. The stakeholder-responsibility matrix.

	Types of CSR			
Stakeholders	*Economic*	*Legal*	*Ethical*	*Philanthropic*
Owners				
Customers				
Employees				
Community				
Competitors				
Suppliers				
Social Activist Groups				
Public at Large				
Others				

Source: adaptation from Carroll, 1991.

The stakeholder-responsibility matrix of Carroll (1991) provides managers with a valuable tool for stakeholder management as well as for the strategic decision-making process (Table 2.7). The conceptual approach can be used to organize the economic, legal, ethical, and philanthropic responsibilities of the firm concerning the identified categories of stakeholders (e.g., owners, customers, employees, community, competitors, suppliers, social activist groups, public agencies and other groups depending on the specific sector and business). The number and the nature of stakeholder groups vary according to the characteristics of the business and the sector as well as the process of stakeholder identification performed. They also depend on the institutional context, the country/region where the organisation is located, the business model adopted, and the type of management. In this way, the management may develop a significant descriptive and analytical database, including the main information resulting from the stakeholder-responsibility analysis. This information is pivotal for the decision-making process of CSR strategies, especially when developing priorities and making both long-term and short-term decisions (Carroll, 1991). The benefits of this approach lie in the integration of social values with the traditional economic objectives of the firm. Indeed, it considers the pluralistic and changing values arising from the environment and it assists the management with the appraisal of corporate responsibilities. For this reason, the matrix represents a valuable managerial tool for CSR purposes and thus for the whole stakeholder management process.

In one sense, CSR theory suggests a way to personalise the relationships with internal and external stakeholders. In line with this assumption, Freeman and Velamuri (2006) outline ten principles for Company Stakeholder Responsibility (Table 2.8) that can help executives to develop a new stakeholder management approach based on CSR values.

These principles (Table 2.8) provide managers with guidelines to improve the relationships between the company and its stakeholders. They are inspired by social and ethical values concerning the respect of human rights and the active involvement of stakeholders in the business. Indeed, Freeman and Valemuri (2006) suggest to treated stakeholders as real people with names and faces and not only as business parties. Moreover, firms are called to find solutions that satisfy simultaneously both primary and secondary stakeholders, making use of an intensive dialogue to understand their requirements.

According to this approach, Carroll (1991) defines three different types of stakeholder management based on the adoption of ethical (or moral) principles by the firm. The first one is immoral management which is characterized by managers whose behaviours and actions manifest a clear opposition to what is considered ethical and correct by society. Their immoral decisions are led by selfish and profit purposes which deviate from the ethical principles shared and accepted by the community. For this reason, this kind of managers are only concerned with corporate profitability and thus consider legal standards as barriers or obstacles which must necessarily be overcome to pursue their objectives.

The second type of stakeholder management is amoral management. In this case, managers are not hostile to ethical principles, but they simply do not understand them. Although this approach is mainly focused on profitability, managers have respect for the law which is not perceived as a barrier for the business. To make it clear, Carroll (1991) distinguishes between intentional and unintentional amoral management. The former approach considers ethics as a part of private life and not of businesses. Consequently, corporate activities do not fall within the sphere of moral judgments and thus moral principles are intentionally neglected. On the contrary, unintentional amoral managers overlook or ignore corporate ethics. However, they are sensitive to learning and to the changes in the competitive environment which may lead these managers to adopt moral principles for stakeholder management.

The third type of ethical approach described by Carroll (1991) is moral management. Moral managers pursue economic objectives and run the business in compliance with the law and ethical principles. The orientation towards legal and ethical precepts is significant in this approach. Indeed, managerial decisions address standards of fairness, justice, utilitarianism and due process.

Therefore, ethics is considered a driving force that assists moral managers with the understanding of stakeholders' needs and the fulfilment of their requests.

Table 2.8. Ten principles for Company Stakeholder Responsibility.

1	*We see stakeholder interests as going together over time.*
2	*We see stakeholders as real people with names and faces and children. They are complex.*
3	*We seek solutions to issues that satisfy multiple stakeholders simultaneously.*
4	*We engage in intensive communication and dialogue with stakeholders, not just those who are "friendly".*
5	*We commit to a philosophy of voluntarism – to manage stakeholder relationships ourselves, rather than leaving it to government.*
6	*We generalise the marketing approach.*
7	*Everything that we do serves our stakeholders. We never trade off the interests of one versus the other continuously over time.*
8	*We negotiate with primary and secondary stakeholders.*
9	*We constantly monitor and redesign processes so that we can better serve our stakeholders.*
10	*We act with the purpose that fulfils our commitment to stakeholders. We act with the aspiration toward our dreams and theirs.*

Source: Author's elaboration on Freeman e Velamuri (2006)

The three types of stakeholder management outline the general ethical approach and orientation of the firm towards stakeholders. However, different behaviours emerge concerning the nature of each specific stakeholder group. For example, the attitude of managers towards employees widely differs according to the type of management adopted. In the case of immoral management, employees are only treated as factors of production. Their rights and needs are almost neglected by managers who use their coercive power to monitor and control the workforce. On the other hand, amoral managers treat employees as the law requires minimal respect. They are still considered as factors of production but in this case, managers attempt to motivate their productivity by carrying out remunerative approaches based on incentives and rewards. In another sense, organisations are driven to meet employees' requests to increase corporate productivity rather than to respect their rights as workers and human beings. When it comes to moral managers, they go far beyond compliance with the law. Employees are treated with dignity and respect, and

they benefit from fair working conditions. Moreover, the management aims to establish a relationship of trust and a stable dialogue with employees to increasingly involve their interests in the corporate decision-making process.

Another topical example of stakeholder management concerning the relationship with local communities. They are considered irrelevant by immoral managers because they do not offer anything in return for corporate efforts. As concern amoral managers, they only follow minimal legal precepts to prevent the occurrence of troubles. In this case, local communities are treated in the same way as employees as factors of production. Conversely, the interests and needs of communities are pivotal for moral managers, who try to establish a strong relationship with them. They arrange several opportunities for dialogue with citizens to involve their concerns in the strategic decision-making process. Indeed, the management believes community and corporate goals are mutually independent and thus the success of the business may largely depend on the relationship with this stakeholder group. However, the attention of moral managers for communities is not only driven by profit purposes, but also by ethical principles. As a result, firms with stakeholder moral management are often committed to several strategic philanthropic initiatives to support institutions in need of help, such as schools, hospitals, theatres, museums, voluntary groups, etc.

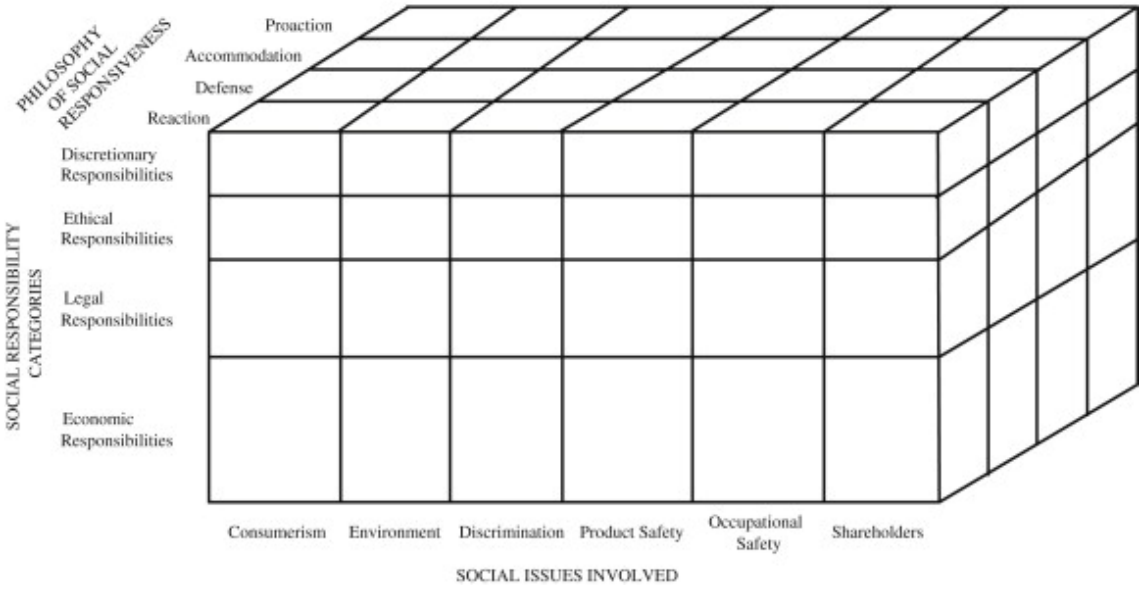
The increasing attention of managers to social, environmental and ethical concerns of CSR has raised the question on the evaluation and measurement of corporate social performance (CSP), in other words, to what extent corporate social actions and initiatives are effective and what is the real commitment of the management to social issues. The concept of CSP has developed since the late 1970s in the United States. In the outstanding article "*Corporate Social Performance Revisited*" Wood (1991) proposes the following famous definition of CSP: "*a business organization's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm's societal relationships*". Therefore, Wood's model proposes three elements to evaluate the CSP of the firm: principles, processes and observable results. The work of Wood grounds two prominent contributions respectively of Sethi (1975) and Carroll (1979).

Sethi (1975) uses three dimensions to evaluate corporate behaviour towards social issues, i.e., social obligation, social responsibility and, finally, social responsiveness. Social obligation refers to the attitude and orientation of managers in response to market constraints and legal requirements. The second dimension deals with the social responsibilities of the firm which go beyond the obligations imposed by the law. They require organizations to respect the values, norms, and expectations emerging from society. Finally, social responsiveness describes the

active role and attitude of organisations towards social issues. The Author explains how managers can anticipate and prevent the claims and needs of those stakeholders belonging to the social environment. According to this framework, Sethi defines CSP as the set of strategies that the firm can use to meet the requirements and expectations of society.

Inspired by the work of Sethi, Carroll (1979) proposes the Corporate Social Performance Model (Figure 2.7), on the one hand, to clarify and integrate various definitions of CSR and CSP arising from the literature, and, on the other hand, to provide managers with a managerial tool to improve planning and diagnosis of social performance. The model is the combination of three dimensions, as follows: corporate social responsibility (the four responsibilities already mentioned in this PhD thesis, i.e., economic, legal, ethical and philanthropic responsibilities), social issues (the identification of clear social objectives or topical social area, which differ depending on the industry and other factors), and, finally, corporate social responsiveness (the sensitivity and responsiveness of the firm to the social issues).

Figure 2.7. The Corporate Social Performance Model.



Source: Carroll (1979)

An interesting concept emerging from the model is the philosophy of social responsiveness: in particular, Carroll (1979) claims it is how the management responds to social responsibilities and social issues. In this perspective, corporate responsiveness has no moral or ethical connotations, but it involves the managerial competencies of forecasting social issues and planning, organising, managing and monitoring social activities in line with corporate social policy.

2.3.3. Drivers and barriers to CSR implementation

In the previous section 2.3.1, the evolving concept of CSR and the underlying theoretical principles for business management has been introduced and briefly discussed. Scholars, practitioners and institutions argue firms can achieve a competitive advantage in the long run by integrating social and environmental concerns of CSR in business operations and, especially, in stakeholder relationship management. However, CSR implementation depends on both internal corporate mechanisms and external factors related to the market and the industry. In his outstanding work, Laudal (2011) suggests investigating the main drivers and barriers to CSR implementation considering two distinctive cases: small and medium-sized enterprises[3] (SMEs) and multinational enterprises[4] (MNEs). In this perspective, firm size and the degree of internationalization may affect the engagement in CSR and its potentiality. Indeed, the economic impact of a firm's activity, the number of employees as well as labour standards and other national or international normative requirements trigger different mechanisms which can facilitate or disadvantage the adoption of CSR practices.

This section provides an overview of the most relevant drivers and barriers to CSR implementation considering the distinction between SMEs and MNEs.

Several studies show that MNEs are more active in CSR-related activities than SMEs. One of the main reasons relies on the high investment costs associated with CSR which give MNEs an advantage of scale (Williamson et al., 2006; Lepoutre and Heene, 2006). McWilliams and Siegel (2001) claim firms with a strong CSR profile bear higher costs related to capital expenditures for special equipment, machinery and real estate devoted to CSR; purchase of material and services from socially responsible suppliers; and progressive human resource management practices and policies aimed to provide better working conditions and benefits to employees. On the other hand, CSR practices can generate higher revenues which reward the firm for the investments made. As a result, large diversified companies can allocate the costs of CSR over many different products and services, exploiting large economies of scale (Matten et al., 2003). Moreover, Laudal (2011) argues CSR-related activities constitute a fixed cost that requires a "critical mass" of benefits to justify the necessary funding. The mass depends on the corporate size and geographical spread of

[3] The European Union (2003) defines small and medium-sized enterprises (SMEs) as enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.

[4] Multinational enterprises (MNEs) are defined as firms that run a business in at least two countries. The degree of internationalization of MNEs is measured by the number of foreign assets or employees hold by the firm (UNCTAD, 2009).

the business. This translates to a huge barrier for SMEs which, conversely, generate lower revenue, suffer from financial constraints, and have limited financial slack to take up opportunities related to CSR practices.

Several studies demonstrate the size and internationalization of the business drive firms to engage in CSR (Moon et al., 2005; Lepoutre and Heene, 2006; Laudal, 2011). The exposure to international competition pushes companies to establish higher CSR standards to keep pace with competitors. Moreover, they are likely called to comply with different norms on workplace conditions, environmental protection and local cultures. This is called by Scherer and Palazzo (2008) "*the pressure of changing societal expectation*". The Authors highlight when firms have multiple standards in sensitive areas to deal with, they run the risk of conflicts with NGOs and public institutions in charge of monitoring their business practices' impact at the social and environmental level.

Another barrier for SMEs is the lack of knowledge and expertise in CSR issues (Lepoutre and Heene, 2006). Cramer (2008) shows that SMEs principally focus on day-to-day operation monitoring products that may lead to risks or products that are strategically important. Due to the shortcoming of employees and managers with analysis skills for examing market trends and drivers shaping the business competitive environment, SMEs do not bother to social and environmental issues, which thus are not perceived as value-added. Many SMEs are also unable to acquire the necessary knowledge to implement an effective CSR policy aiming, at least, to mitigate threats, outside of their area of operation (Laudal, 2011). This means CSR performance is an accessible source of competitive advantage for mainly MNEs that can allocate time and expertise in an activity where no immediate returns could be expected.

Although SMEs do not consider the risks to public reputation and brand image linked to CSR, they show a sensitivity to "close" stakeholders, such as employees and local communities (Laudal, 2011). In this regard, Jenkins (2009) argues CSR strategies of SMEs simply address supporting the local economy and to employ and involve people belonging to the local community. SMEs typically have a strong relationship with the local civil and cultural environment and tend to be more aware of local risks and emerging issues than MNEs. Their philanthropist and attentive behaviour towards the community lower public pressure and create a stronger bond with local customers.

The sensitivity to local stakeholders grounds on the concept of the license to operate in which firms are called to tacitly or explicitly achieve the consensus from public authorities, political parties, associations and other stakeholders to do business (Porter and Kramer, 2006). Moon et al. (2005) define this behaviour as corporate citizenship referring to a company's responsibilities

towards society. In some cases, this appears even more critical for SMEs since the license to operate from local communities represents a prerequisite not only for their competitiveness but also for their survival in the market.

The decision of the CSR level in SMEs depends largely on the owners or managers (Jenkins, 2009). Most of these companies are family-run and the role of owner and manager often coincides. Also, the lack of shareholders and investors simplifies the adoption of socially responsible principles. As a result, SMEs may have an advantage in developing CSR strategies. They are exposed to a lower risk of opportunistic behaviours as well as to a shorter decision-making process than MNEs. Large and complex organizations face, in fact, major challenges regarding internal management and control of CSR practices and policies. This is due to the potentially conflicting interests of internal stakeholders, such as the board of directors, managers and employees. Therefore, the success of CSR standards in MNEs relies on motivation, transparency and alignment of interests between all different organizational levels.

Mimetic isomorphism is another relevant CSR driver. DiMaggio and Powell (1983) define this behaviour as an imitative process in which organizational characteristics are modified due to environmental uncertainties. In other words, firms emulate leading companies, competitors or influential stakeholders' managerial practices to seek a competitive advantage or to increase their legitimacy. Then, Laudal (2011) stresses the dissemination of CSR may benefit from mimetic isomorphism. However, it requires first movers capable to influence the other firms and stakeholders' behaviours.

One of the most cited drivers of CSR in literature is corporate reputation (Branco and Rodrigues, 2006; Laudal 2011). It reflects the public perception of the firm by consumers, employees, investors, communities and other internal and external stakeholders. Reputation represents a fundamental intangible resource for firms, especially for MNEs with high brand recognition and well-known logos (Branco and Rodrigues, 2006). On the other hand, SMEs are less vulnerable since they are less visible and exposed to public pressure. The sensitivity to public perceptions is thus a central issue for MNEs when the investments in CSR enhance or protect their public image. For this reason, many large companies are used to communicate their CSR performance and engage stakeholders through traditional media (e.g., radio, television and press) and new social media marketing tools.

Given the above, the sensitivity to public perceptions is not considered only as a defensive measure aimed to prevent the threats from the public sphere, but also as an opportunity to improve the image of the firm (Laudal, 2011). Hence, CSR may be a fundamental strategy for MNEs to generate a positive public attitude towards the firm.

To conclude, CSR-related activities may be a part of corporate measures to ward off restrictive (potential) government regulations (Williamson et al., 2006). This means powerful firms may invest in CSR to influence market rules and conditions as well as companies' behaviours to the aim of protecting their autonomy and competitive position. In this perspective, CSR emerges as a strategic tool for MNEs to mitigate business risks and engage in public policy processes (Laudal, 2011). Besides, MNEs can leverage their influential role within the market to drive policymakers to outline a framework of rules in favour of their CSR strategy.

However, CSR-related activities must be communicated to both internal and external stakeholders to reach their set strategic objectives. Conversely, they risk not generating the expected business benefits and remaining only ethical actions.

2.3.4. CSR communication

CSR communication represents a pivotal strategic activity in modern organizations since it exerts a great influence on the behaviour and judgments of internal/external stakeholders and of the public opinion towards the company (APCO, 2004). This form of communication has acquired increasing importance over the years for both scholars and practitioners that recognise well-planned, correct, transparent and open communication as a valuable tool to manage stakeholders and to counter their scepticism towards company sustainable initiatives (Mitchell et al., 1997). Moreover, several studies have stressed the relevance of CSR communication for strengthening corporate reputation and, in general, supporting corporate communication strategies (Maignan et al., 1999).

Before starting to scrutinise CSR communication, it is important to define what is corporate communication and why it is linked with communication concerning corporate sustainability and social initiatives. Van Riel and Fombrun (2007) define corporate communication as the set of internal and external communication forms and tools used by the organisation to create a solid relationship with stakeholders. At the corporate level, "everything" communicates, from the company's attitude towards the competitive environment to the statements made by shareholders or the board of directors. Indeed, each action or initiative may affect the stakeholders' opinion of the organisation and thus its reputation. For this reason, the main goal of corporate communication is to improve the public perception of the organization by sending the right message to the right stakeholder. Given the above, the corporate social commitment must be directly or indirectly part of corporate communication because it can enhance the ethical dimension of corporate activities, improving the image of the organisation and its relationship with salient stakeholders. According

to Lewis (2003), CSR is a priority for a public and private organisation and consequently, corporate communication must include CSR communication.

Dawkins (2004) argues that CSR communication represents the missing link between corporate commitment to ethical and social issues and CSR concrete initiatives. In another sense, organisations are not always able to give the right visibility and credibility to their commitment, jeopardising their efforts. Therefore, CSR communication aims to disseminate correctly and transparently the environmental, social, and economic commitment of the organisation, by increasing involving stakeholders in the corporate decision-making process (Morsing, 2006). As a result, effective CSR communication requires accurate strategic planning, capable of meeting the objectives of corporate communication and responding to the needs of stakeholders.

When it comes to academic studies, scholars have provided several definitions of CSR communication, without however deepening the real reasons that drive companies to communicate their social commitment. Moreover, they have almost neglected to investigate how and to what extent CSR communication may affect corporate SRM. Nevertheless, academic definitions help to understand the nature of CSR communication and pave the way for future studies towards previous open issues. In this perspective, Morsing (2006) states CSR communication is properly designed for giving voice to corporate social commitment. Podnar (2008) defines CSR communication as a process of anticipating stakeholders' expectations and shaping CSR internal policies by managing various communication tools. Consequently, CSR communication aims to create a two-way transparent dialogue with stakeholders, by using the whole arsenal of marketing and corporate communication, including sponsoring, public relations, media advertising and sustainability reports (Reisch, 2002).

In conclusion, CSR communication is focused on the good deeds performed by the company to meet various stakeholders' expectations (Clark, 2000). Given the wide array of heterogeneous stakeholders' needs, it pursues several objectives related to the type of recipient of the communication.

2.3.4.1. Objectives and key success factors of CSR communication

As the other corporate strategic activities, CSR communication pursues specific objectives that must be consistent with social and environmental issues as well as with the needs of stakeholders (Birth et al., 2008). In this regard, Table 2.9 reports the main CSR communication objectives according to the typology of the recipient (i.e., group of stakeholders).

Table 2.9. The main CSR communication objectives according to each group of corporate stakeholders.

Group of Stakeholders	Objectives	Motivations
Clients / Customers / Users	To strengthen corporate reputation.	A good corporate reputation influences the satisfaction of consumers and the appeal of the products and services provided by the company (Dawkins and Lewis, 2003).
	To differentiate the products/services provided.	Differentiation allows achieving a competitive advantage over competitors, not only in terms of innovative, different, or additional features of the product/service but also in terms of ethical-social perspective (APCO, 2004).
	To improve loyalty.	Loyalty is pivotal for corporate success. It is based on values such as transparency, respect, greater commitment, and attention to social issues (Keller, 1993).
Employees	To strengthen corporate reputation.	Corporate reputation may heavily depend on internal word of mouth. Employees are one of the most powerful communication channels and thus they can disseminate messages and information about the company, positively affecting its reputation (Dawkins and Lewis, 2003).
	To increase employee's satisfaction and commitment.	Social issues directly concern employees (e.g., working conditions). For this reason, CSR communication has the potential to enhance their loyalty towards the company, contributing to its image and reputation (Bevan and Willmott, 2002).
	To improve corporate appeal.	Potential employees are usually attracted to the ethical integrity and responsibility demonstrated by the company (Bevan and Willmott, 2002; Keeler, 2003).
	To reduce employee turnover.	CSR communication may enhance employee retention since a socially responsible organization tends to meet the expectations and needs of its employees, discouraging their departure (Bevan and Willmott, 2002).
Shareholders/investors	To attract investments.	Investors are more willing to invest in a socially responsible company (Keeler, 2003). For this reason, CSR communication can create a more favourable climate around the company to attract more investments.
	To enhance profit and share value.	Socially responsible organizations, which also stress and disclose the benefits arising from CSR strategies/initiatives, may achieve a much higher profit, enhancing the share value (Mainelli, 2004.

Source: Author's elaboration

Although the general objectives and related motivations reported in Table 2.9, several studies show that CSR communication varies according to different exogenous and endogenous factors, including the nature of the organization and the geographical area/competitive environment (Welford et al., 2007), corporate size (Graafland et al., 2003), and the department in charge of

corporate communication (Porter and Kramer, 2006). Managers must consider these factors when dealing with their CSR communication strategy to improve its effectiveness and broaden the potential audience. Indeed, CSR communication has the potential to reach various and heterogeneous recipients, including legislators, business press, investors, NGOs, local communities, consumers, and employees (Dawkins, 2004). If on the one hand, the numerous and different recipients are eager to obtain as much information as possible about the activities of social interest carried out by the company, on the other hand, they tend to easily yield to scepticism, especially when these actions are subjected to too much promotion (Du et al., 2010). Therefore, to be effective, CSR communication needs to overcome the scepticism of stakeholders, generating consensus and participation. This occurs when the CSR communication strategy unambiguously and correctly defines what to communicate (e.g., the content of messages), where to communicate (e.g. channels), the objective to be pursued and it identifies the potential factors that could influence the effectiveness of the communication process (Du et al., 2010).

Given the above, the key success factors of CSR communication are summarised below (Schlegelmilch and Pollach, 2005):

- the credibility of the source (issuer);
- the honesty of statements (the content of the message);
- the involvement of the public (recipient).

Several factors can further contribute to the success of communication, including the achievement of awards and recognitions, the publicity of the real contributions guaranteed to NGOs, media coverage and the involvement of stakeholders in CSR actions and the decision-making process (Hirschland, 2006). Among them, some studies show that the duration of the company's commitment to a social cause is a crucial element for evaluating the motivations underlying this ethical-social effort. Indeed, stakeholders, especially local communities, generally tend to consider a long-term commitment more authentic, since it originates from a real interest in the growth of social well-being (Webb and Mohr, 1998). On the contrary, a short-term commitment, based on short-term campaigns and initiatives, is usually considered as evidence that the company is more oriented to exploit a social cause for purely economic purposes than to fight for real social rights and benefits (Webb and Mohr, 1998). Overall, the success of CSR communication relies on the perception of stakeholders about the CSR initiatives carried out by the company (Menon and Kahn, 2003). As a result, the lack of a natural fit between CSR initiatives and CSR communication can negatively affect the perception and evaluation of stakeholders of the organisation (Du et al., 2010).

2.3.4.2. The trustworthiness of CSR contents

One of the most common problems related to CSR communication concerns the perception of stakeholders of the disclosed contents which are often perceived as exclusively self-celebrating (Sen et al., 2009). Transparency covers a pivotal role since the content of CSR messages are difficult to verify and evaluate (Carroll, 1999). Therefore, CSR communication must ensure that the information disclosed concerning the initiatives is related to the behaviour of and principles promoted by the company. In this vein, the Directive 2014/95/EU goes towards this direction. Indeed, it introduces the principles and guidelines to support large European companies in disclosing correctly environmental and social information concerning the business and thus make their CSR communication more transparent.

CSR generally suffers from a substantial lack of credibility, due to the scepticism nurtured by stakeholders towards the company's commitment to ethical and social issues (Sen et al., 2009). This sentiment grows especially when the organisation heavily promotes its efforts for sustainable goals using aggressive marketing tools which usually are aimed at increasing corporate profit. For this reason, to be perceived as truthful, CSR communication should emphasise the corporate commitment to only one or a few social causes. The existence of strong motivations for a particular social issue leads stakeholders to trust in the initiatives promoted by the company. Moreover, CSR communication should clarify the reasons and motivations underlying the CSR actions, which must be consistent with the core business of the company as well as with the chosen social cause(s). In this way, the organisation can limit the suspicions and scepticism of stakeholders and strengthen the credibility of its communication on social issues (Menon and Kahn, 2003).

The trustworthiness of CSR communication depends also on the type of recipient and its awareness of social issues and related implications. Bhattacharya and Sen (2004) argue the stakeholders' knowledge and awareness of a specific social issue deeply affect the success of the CSR communication strategy. In this sense, access to corporate information is not enough to understand the goals and the rationale behind CSR initiatives. Consequently, the contents of CSR messages must be clear and unambiguous. Also, stakeholders need to be guided in the comprehension of CSR contents issued on different channels to avoid misunderstandings and to make sure of delivering the right message. As a result, CSR communication should create an interactive dialogue with stakeholders based on an empathic, respectful, and efficient exchange of opinions and ideas (Friestad and Wright, 1994). In this way, the involvement of stakeholders enhances the reliability and credibility of CSR communication since they can actively contribute

to corporate CSR initiatives or express their opinion on a specific social issue they are interested in (Bhattacharya and Sen, 2004).

2.3.4.3. The effectiveness of CSR communication

In line with the previous section 2.3.4.2, the effectiveness of CSR communication relies on the trustworthiness and credibility of CSR contents and messages. To this end, the organisation is expected to shape its approach to corporate communication, leaving the neutral and formal tones of traditional communication strategy, in favour of more informative, educational, and emotional tones. Furthermore, credible CSR communication cannot ignore wide media coverage, which is perceived as more reliable compared to the disclosure of corporate information via only official reports (Goodman, 1998). This is due to the re-processing of corporate information by third parties (e.g., communication agencies, advertising agencies, press agencies, etc.) who work professionally for the organisation to improve the effectiveness of corporate communication.

Some studies have shown that stakeholders tend to react positively to CSR activities when they received updates from a "neutral source" (Yoon et al., 2006). In this perspective, the credibility of CSR messages and their effectiveness is inversely proportional to the degree of control exerted by the company: the more independent is the sender of the message from the company, and the more the CSR communication is perceived as credible and thus reliable by stakeholders. For this reason, companies often exploit the potential of some categories of stakeholders to disseminate the information concerning their social initiatives, which can be directly or indirectly influenced by the organisation (Dawkins, 2004). Indeed, academics have demonstrated that employees tend to recommend the company they work for and to feed the positive word of mouth of its initiatives if managers adopt responsible and attentive approaches to environmental, social and economic issues (Dawkins, 2004).

The reasons that lead organizations to prefer one communication tool over another to enhance the effectiveness of CSR communication have raised the attention of the European Commission (2001a; 2001b). In the contributions "*Green Paper: Promoting a European Framework for Corporate Social Responsibility*" and "*Promoting a European framework for corporate social responsibility*", the European Commission sustains the most used communication tools for promoting CSR initiatives are sustainability reports, websites and advertising, in combination with corporate codes of conduct, online and offline interaction with stakeholders, internal channels, social networks, blogs, events, packaging, articles, etc. Sustainability reports continue to be the main tool used for CSR communication and reporting since they highlight the social and environmental impact of corporate actions as well as their implications on stakeholders and the

whole society (Gray et al., 1996). However, since the 90s sustainability reports have been considered arbitrary and rarely based on quantifiable data. Therefore, some European governments (e.g., France and Spain) have issued a series of laws to regulate the drafting and publication of these documents, while a more organic intervention by the European Commission is still required (Tschopp, 2005).

Given the above, CSR communication can make use of a wide array of channels whose strategic importance depends primarily on the degree of control that companies exercise over them. In line with the advent of web 2.0 and social media, the number of authorized "senders" of CSR messages has rapidly grown. Indeed, social media play a leading role in CSR communication, since they can influence the communication agenda and disseminate corporate information at a lower cost and much faster than in the past.

In conclusion, the effectiveness of CSR communication often stems from integrated and coordinated communication which requires a holistic approach consistent with the objectives of corporate communications, the requirements and expectations of stakeholders and the CSR initiatives carried out by the company.

2.4. Conclusion

This chapter provides a comprehensive summary of the extensive literature available in the context of stakeholder theory. It stresses the main theoretical constructs and managerial principles of stakeholder relationship management (SRM) and corporate social responsibility (CSR). Given the increasing importance of networks as well as formal and informal relationships between the key actors of maritime logistics ecosystems and related heterogeneous stakeholders (see Chapter 1 for further reading), these theoretical constructs and managerial principles are applied in the following chapters of the PhD thesis in the specific domain of maritime logistics to investigate how they can support key actors with tackling the main urgent challenges of the industry (i.e., environmental, social and technological challenges).

Besides, the academic debate on stakeholder management in maritime logistics has a recent origin and a lack of empirical contributions persists. This leaves several rooms for further studies and alternative approaches. In this perspective, this PhD thesis considers the perspective of multiple key actors of the maritime logistics ecosystem and makes extensive use of the theories discussed in this chapter to disentangle the managerial benefits deriving from the more effective management of salient stakeholders.

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CHAPTER 3

THE IMPACT OF INNOVATION ON DOCK LABOUR: EVIDENCE FROM EUROPEAN PORTS

3. The impact of innovation on dock labour: evidence from European ports

Notteboom, T., and Vitellaro, F. (2019). The impact of innovation on dock labour: evidence from European ports. *IMPRESA PROGETTO*, (3), 1-22.

Abstract

The market environment of ports and terminals is continuously pushing terminal operators to achieve higher levels of dock labour performance. This paper proposes an original conceptual framework to identify, classify and evaluate innovative initiatives of terminal operators addressed to enhance dock labour performance. We link the innovation concept to a market-driven perspective on the organization of dock work in light of changing market requirements. The conceptual approach not only considers technological innovations but also organisational and regulatory innovations. The framework is used to analyse a set of innovative initiatives of terminal operators in European seaports. The findings reveal that innovative initiatives can have very different characteristics and ramifications when looking at the type of innovation, the boundaries of innovation, the nature of the actors involved, the (expected) magnitude of impact and the impact of labour performance.

Keywords: innovation; port labour; dock worker; automation; competitiveness

3.1. Introduction

Structural changes in the maritime and logistics market have deeply reshaped the port industry and consequently labour requirements (Notteboom, 2018). Existing studies on port labour are primarily focused on the social implications related to port labour (see e.g., Ircha and Garey, 1992; Turnbull and Wass, 2007) whereas economic and managerial approaches are generally neglected. On the contrary, port labour performance strongly affects the supply profile of ports and terminals, in terms of both efficiency and quality of services (e.g., service reliability, speed of vessel turnaround and berth availability). Regarding this aspect, Trujillo and Nombela (1999) and Turnbull and Wass (2000) have demonstrated the existence of a correlation between managerial inefficiencies, unreliable services and modest operational performance of ports on the one hand, and labour regimes and human resources management on the other hand. Satta et al. (2019) argue dock labour has a huge impact on port reputation and its market profile (see, e.g., negative implications of strikes organised by dockworkers trade unions on port reliability and reputation). Port labour is a key production factor in the port and terminal environment and can be placed side by side to the other production factors, i.e., land and capital (e.g., cranes, yard equipment and terminal management hardware and software system) (Notteboom, 2018). Specific efforts and investments by terminal operators are required (e.g., new hires, training courses, improvement of working conditions, etc.) to meet dockworker needs and enhance port productivity.

In this perspective, a poor labour organization can negatively affect port competitiveness. Strict working conditions, especially in the container stevedoring industry, reduce terminal productivity and reliability. Satta et al. (2019) claim working arrangements may undermine the ability of terminal operators to deal with the optimal allocation of human resources in different job positions. Considering the highly variable demand for stevedoring services, labour flexibility contributes significantly to port competitiveness, by avoiding overstaffing or understaffing periods (Notteboom 2010). Labour contracts should be flexible enough to prevent excessive costs (in case of a surplus of workers) and operational efficiency (in case of dockworkers shortages). However, many terminal operators have to deal with strict labour regulations, which differ from one country to another and/or from one port to another. This limits their flexibility in daily management as well as their competitive position in the market. Legal requirements, such as employment levels, payments and remuneration schemes, do not comprehensively cover all the aspects related to effective management of port labour, as a part of past literature sustains (Ircha and Garey 1992; Turnbull and Wass 2000). Job qualification, career development, team organization, education and training programs, health and safety conditions are considered as critical elements of labour contracts which deeply affect dockworker performance (e.g., working

time, shifts, mental and physical stress, rate of accidents, etc.) (Turnbull and Wass 2007; World Bank 2007; Mitroussi and Notteboom 2015).

Notably, the labour market increasingly requires more skilled workers, especially after the advent of digital technologies embedded in the paradigm of Industry 4.0. In this regard, Schröder-Hinrichs et al. (2018) claim that highly skilled and educated workers are more inclined to employ new technologies to perform their tasks. As a consequence, the demand for such workers has been rising in recent decades along with the introduction and diffusion of new equipment and digital technologies (e.g., Acemoglu and Autor, 2011). Arntz et al. (2016) estimate 14% of existing jobs in 21 OECD countries are at risk of becoming automated. The majority of the industries, indeed, rely on middle-aged workers and this represents an incentive to invest in automation and digitalisation. When it comes to the port industry, Frey and Osborne (2017) argue 27% of dock work is already automated and nearly 85% of their tasks will be automated by 2040. Therefore, dockworkers are challenged to acquire specific technicalities to meet current and future labour market requirements. In this perspective, terminal operators could design ad hoc training systems and introduce an innovative labour organisation, since huge investments in terminal equipment and infrastructure may not be sufficient to guarantee an improvement in overall port performance.

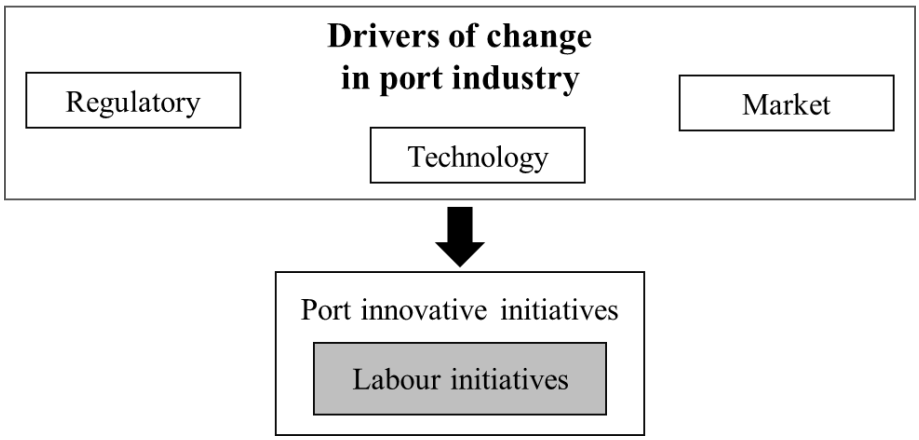
Given the critical role of the workforce for port and terminal competitiveness and the lack in the academic literature of comprehensive studies concerning port labour implications related to structural changes in the maritime and logistics market, the paper proposes an original conceptual framework to identify, classify and evaluate innovative initiatives of terminal operators addressed to enhance port labour performance and meet new market requirements. In particular, the paper is structured as follows. Section 2 examines the main drivers (i.e., market, regulatory and technological drivers) which are shaping the port industry and the role of innovation for port competitiveness. Section 3 addresses the methodological issues to evaluate innovative initiatives in the port domain. In section 4, we apply the conceptual framework to five examples of innovative initiatives in the European port industry. Finally, section 5 summarises the conclusions and main implications of the research.

3.2. Drivers of change and innovation in the port industry

Several scholars have proposed various frameworks to identify the main factors of change in the port industry and to evaluate their implications on port labour. Nonetheless, the focus of these academic contributions predominately is on one single aspect, such as port reform (Brooks 2004), health, safety and security regulation (Naniopoulos 2000), automation (Yeo et al. 2008) and market changes (Notteboom 2010; 2012), leaving room for more inclusive studies. Therefore, the

present study grounds on a wider comprehensive framework which identifies three main drivers of change in the port domain (Figure 3.1), as follows: (i) regulatory (institutional and normative) drivers; (ii) market drivers and (iii) technology drivers. These drivers represent the cornerstone for understanding terminal operators' strategic decisions to face the new competitive environment. In this perspective, innovation is a critical factor since innovative initiatives can significantly contribute to meet the increasing market needs and improve terminal performance, especially regarding the workforce.

Figure 3.1. Drivers of change in the port industry and innovative labour initiatives.



Source: authors' own elaboration

3.2.1. Regulatory drivers

The port and the maritime industry is regularly confronted with changes in the regulatory and legal framework (Notteboom and Winkelmans, 2001). Since the 1990s, the deregulation trends in the port industry have been focused on promoting the entry of private terminal operators in the industry to boost port competitiveness as well as the financial transparency of public managing bodies and private port-related companies (European Commission 2004; Brooks 2004; Verhoeven 2009; Pallis et al. 2010). The privatization process has led to wider adoption of the landlord port model by the majority of EU ports (Cariou et al. 2014). This model consists of a well-balanced division of liabilities between public and private actors, in which the latter oversees commercial activities (Comtois and Slack 2003). The corporatisation and privatization processes in the European ports in quite a few cases have deeply affected port labour since management and organization of operations fully or partially passed from public entities to private companies. The port reforms have also impacted dock labour employment systems in Europe. Many countries

have abolished (full) labour pool systems (Notteboom, 2018), considering the high number of labour-related inefficiencies (e.g., excessive pools, rigid work rules, etc.) (Turnbull and Wass 2007; Van der Lugt et al. 2013). Therefore, an increasing number of private terminal operators can directly hire dockers for their business based on their needs and, thus, they have higher control over the recruitment processes (Satta et al., 2019). However, the new reform schemes have revealed some weaknesses related to the emergence of social conflicts triggered by the worsening of dockworkers' conditions and wage reductions (Turnbull and Wass 2007). Health, safety and security issues represent traditionally hot topics in this industry since ports are considered one of the most dangerous work environments. Consequently, trade unions are particularly active and put a lot of pressure on public managing bodies aiming at drawing attention to the numerous risks that stevedores are exposed to (Turnbull and Wass 2000). At the same time, accidents at work degrade the level of terminal efficiency due to work suspensions and a serious stretching in the operating time. In this perspective, terminal operators have implemented quality management systems and innovative control systems for the identification of potential hazards (Alderton and Saieva, 2013). Furthermore, they have invested in new ergonomic equipment to prevent injuries and diseases (Yeo et al. 2008) and to raise the overall operational efficiency.

Despite the abovementioned positive improvements and the recent document realised by the European Commission aiming at defining standards and more protective rules for dockworkers in the European ports (European Commission, 2013), port privatization has led to the emergence of precarious employment, part-time and temporary job positions (Satta et al., 2019). These categories of workers are generally less skilled and experienced which can increase the risk of accidents and injuries. Furthermore, a downsizing of the number of dock workers can result in higher pressure on the remaining pool of workers (Notteboom 2010). Turnbull and Wass (2007) have demonstrated workers in such a case suffer from higher physical and mental stress, which deteriorates labour conditions and increases the risks at the workplace.

In conclusion, performance at work is likely to be negatively affected in case dockworkers are not sufficiently protected by an appropriate regulatory framework.

3.2.2. Market drivers

Over the past few decades, the reduction of trade barriers and the delocalization of production activities towards developing countries have supported the strong growth in maritime transport demand, especially before the global financial crisis (Notteboom and Rodrigue 2005). The intensification of trade has put a lot of pressure on ports due to cost and time efficiency and reliability requirements imposed by bigger ships and larger cargo volumes. Consequently,

terminal operators have been called to heavily invest in new equipment and embrace new approaches to labour organisation and human resources management (Baird 2002). Notably, the deployment of mega-vessels and the rise of transhipment operations are challenging terminal operators to further improve the performance of ship-to-shore activities, including port labour productivity. For example, the introduction of innovative cranes and equipment involves specific professional competencies which require ad hoc training courses and more skilled dockworkers (Satta et al. 2019).

Another important characteristic of maritime traffic is the significant level of volatility and seasonality in the cargo volumes to be handled at seaport terminals (Stopford 2009). Consequently, terminal operators are inclined to keep a core workforce and hire additional (temporary) dockworkers to deal with peaks in the market (Naniopoulos 2000). The additional workforce is provided by job agencies or official labour pools directly managed by the port itself, according to the current regulation on labour port schemes (Satta et al. 2019). Furthermore, the high variation of transport demand determines a rearrangement of working practices for achieving further flexibility and operational efficiency. In this regard, Notteboom (2010) proposes an innovative organisational model based on new working procedures (e.g., variable shift lengths, additional shifts, flexible starting times, etc.) to increase terminal operators' flexibility and boost their competitiveness. Moreover, Turnbull and Wass (2007) suggest terminal operators invest in ad hoc courses for training multi-skilled dockworkers who can be able to cover diverse jobs and perform various tasks.

As regards the impact of changing market needs, Notteboom (2018) underlines the crucial role of shipping companies, third-party logistics service providers and shippers in reshaping logistics requirements on ports and terminals, including higher port labour performance. Notably, terminal operators are called to meet market requirements if they want to attract cargo and defend their competitive position. Therefore, they are expected to analyse demand needs and adjust or implement the array of services provided. Several authors have dealt with specific shipping lines' requirements (see e.g., Lam and Dai, 2012). Notteboom (2009) proposes an original framework to investigate the main relevant groups of factors affecting shipping lines' demand, which encompasses dock labour as a part of the supply profile of ports and terminals. The author demonstrates dockworker relationships and productivity affect decisively terminal operators' performance such as container handling rates, speed of vessel turnaround, berth availability as well as its market reputation (e.g., service reliability).

Conversely, fewer academic contributions address port and terminal-related requirements of third-party logistics service providers and shippers. In this regard, Nir et al. (2003) point to factors

such as the price of port services, reliability of services, low transit time for goods, cargo security and damage prevention and ICT platforms to support the interaction between customer and supplier and facilitate information flows (e.g., track and tracing services).

3.2.3. Technology drivers

New technologies are considered one of the key drivers of change in the port domain (Notteboom, 2012; 2018; Satta et al. 2019). Technological solutions, indeed, are expected to create new opportunities for terminal operators as well as to shape the future port labour environment, affecting the work of both white-collar and blue-collar employees. Turnbull and Wass (2007) demonstrated automated systems lead to a considerable cost reduction related to the workforce in container terminals and a rise in labour productivity. As reported in the previous section (market drivers), new generation cutting-edge equipment for cargo handling can heavily affect the overall efficiency of ship-to-shore operations, supporting terminal operators to meet shipping companies' requirements, especially concerning the accommodation of bigger ships. In this perspective, automatic crane control (ACC), automated guided vehicles (AGV) and automated stacking cranes (ASC) represent the most diffused technological innovations to handle cargo from ship to shore and from the quay to the stacking area (Naniopoulos 2000). Additionally, digital technologies and ICT systems can boost operational flexibility of terminal operations as well as enhance service differentiation (Agrifoglio et al. 2017). However, all the above-mentioned technologies require massive investments, which lower the flexibility of terminal operators' cost structure and might require a (partial) reorganization of port labour. Large cargo volumes and low volatility in traffic flows represent some of the essential conditions to guarantee enough revenues for justifying investments in innovative equipment technology (Satta et al. 2019).

The introduction of technological solutions can generate several relevant benefits for dockworkers in terms of job safety and working conditions. Still, new terminal technology also triggers discussions on some critical issues. Satta et al. (2019) underline that different limits exist related to the adoption of new technological equipment because of the possible inertia of dockworkers in terms of attending training courses or making changes to their work routines (i.e., methods and procedures). Hence, terminal operators are called to develop more sophisticated and advanced training programs as well as to change the internal communication strategy and social dialogue processes for enhancing the motivation and productivity of their employees (Ircha and Garey 1992; Notteboom et al. 2010).

As regards working conditions, the introduction of automated systems causes an intensification of stress for stevedores due to higher responsibilities and more complex tasks (Notteboom 2010).

Moreover, Hakam and Solvang (2009) argue new technological solutions and tools are going to reduce the dimension of the labour force in terms of the number of employees, especially for those tasks which still require manual work. In particular, the downsizing of the workforce concerns both personnel employed in the quay area and warehousing activities (Ircha and Garey 1992).

3.2.4. Port innovative initiatives in a port environment driven by change

According to Schumpeter's theory (1939), innovation is "doing things differently in the realm of economic life". It represents a linear path that determines irreversible mutations in the competitive conditions of the market and affects the long-run growth of any firm, independently of the market they are involved in. This concept has been further investigated in subsequent economic studies, especially regarding the conditions and implications of the introduction and diffusion of innovative initiatives. In particular, Rogers (1962) describes the innovation path as a dynamic and complex process made by the combination of a plurality of factors, including resources and knowledge, which pave the way to the success and the uptake of a specific innovation. Although academic literature is full of different definitions of innovation, Vanelslander et al. (2019) draw attention to two main similarities: first, innovation drives change, and second, there are different kinds of innovation (i.e., new products or a new quality of products, new production models, new markets, new sources of supply of raw materials and intermediate goods, and new managerial and organisational models). In this perspective, the Guidelines for Collecting and Interpreting Innovation Data (Manual, 2005identifies four groups of innovations: product innovations, process innovations, marketing innovations (aiming at regulating internal/external relations) and organisational innovations, including workplace and workforce organisation. When it comes to the rate of adoption and diffusion of innovation in a specific industry, Powell and Grodal (2005) emphasise the importance of communication and collaboration among the actors of the same competitive environment (e.g., port industry) as well as the relationship between managers and employees of the same firm. The development of a given innovation, indeed, grounds the process of interactive learning and the exchange of knowledge.

Given the above definition of innovation, this study focuses on the academic literature related to the port industry and, specifically, to port innovative initiatives. In the previous paragraphs, the paper examined the recent significant changes occurring in the maritime logistics environment. To face this profound period of transformation, ports have made considerable progress in various areas, aiming at enhancing their performance and the quality of services provided (Slack and Frémont, 2005). Innovation plays an important role in supporting and advancing the development

and management of port activities (Vanelslander et al. 2019). Several authors assert innovation contributes significantly to ports' competitiveness and it appears essential for maintaining and enhancing the competitive advantage of the whole supply chain they are involved in (Jenssen 2003; Flint et al. 2005). However, terminal operators have not fully undertaken innovation processes yet, despite innovation is widely considered as a strategic factor for seaports (Acciaro et al., 2018). One of the main constraints concerns their attitude towards co-operation, which slows down the diffusion and the adoption of new technological and organisational innovations. This issue has also been observed by the International Transport Forum (2010) that registers less pro-activity of transport and logistics firms to introduce innovative solutions in their business in comparison with other industries. In addition, Acciaro et al. (2018) underline port innovation initiatives are often derived from incidental success, which denotes a partial misalignment between the strategic objectives of maritime logistics companies and their rate of success.

As regards academic studies in the transportation field, they are mainly focused on the assessment of investments addressed to improve the economic and social impact of transport infrastructure, including port facilities (e.g., cost-benefit analysis) rather than to evaluate innovative processes and managerial implications (Zheng and Negenborn 2017). Despite this, some scholars (see e.g., Aronietis et al. 2009) have recently investigated how innovation can advance the general performance of transport firms, going beyond the economic perspective. The presence of a collaborative environment and the dynamic interaction among private and public actors in the port domain appear as key elements for the development of innovation paths (De Martino et al., 2013). In this regard, private firms often assume the role of innovation leader and, thus, coordinate the efforts of cluster members aiming at supporting innovation processes. Conversely, processes without a (private) firm leader seem to be less effective in achieving success (Acciaro et al., 2018). Another important aspect is the concept of co-innovation. In this vein, Vanelslander et al. (2019) draw attention to collaborative innovation among supply chain stakeholders, which can widely affect port-related activities and pave the way for future maritime and port-related innovation development. Given the heavy role of public institutions in the port industry, academics agree that the design of a clear system of rules may create a fairer competitive environment and stimulate port stakeholders to avoid opportunistic and conservative behaviours (Acciaro et al. 2018). Consequently, policy and regulation can support cooperation within the maritime cluster and promote port innovation development. Public authorities should increase the awareness of port stakeholders regarding the importance of innovation for port competitiveness and the opportunities to exploit agglomeration scale economies through wider synergies among maritime and port actors.

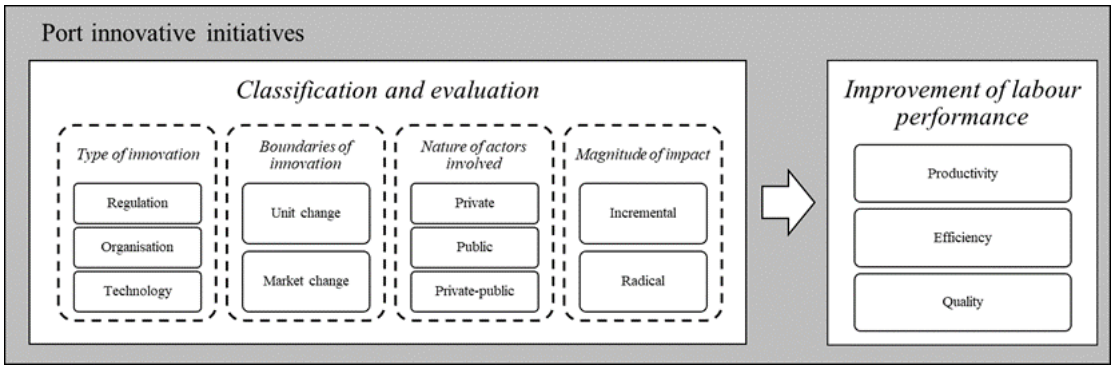
In summary, the co-operation behaviour of port stakeholders and supporting regulation may speed up innovation processes and generate greater benefits for all the participants involved in the process, including dockworkers that represent one of the main stakeholders of the port industry.

3.3. Methodological approach

3.3.1. Conceptual framework on port labour innovative initiatives

Previous academic studies (see e.g., Trujillo and Nombela, 1999; Turnbull and Wass, 2000; Notteboom, 2018) have demonstrated port labour performance deeply affects port and terminal competitiveness. However, economic and managerial approaches to the evaluation of labour measures are generally neglected in the port domain. Therefore, the paper proposes an original conceptual framework to classify and evaluate innovative initiatives addressed to port labour (Figure 3.2). The framework intends to define how ports and terminal operators face the changes in the port competitive environment by performing innovative initiatives aiming at improving port labour performance. Our approach grounds on the wide concept of innovation (see paragraph 2.4) and its critical role in the growth strategy of port and terminal operators.

Figure 3.2. The conceptual framework.



Source: Authors' own elaboration

To this aim, the framework reports a two-steps methodological approach. First, it classifies and evaluates port innovative initiatives according to four dimensions (i.e., type of innovation, boundaries of innovation, nature of actors involved, and magnitude of impact). Second, it scrutinises the impact of these actions on port labour performance, considering three different

dimensions, as follows: labour productivity, labour cost efficiency and quality of labour. The following paragraph explains in detail each of the building blocks of the conceptual framework.

3.3.2. Methodological building blocks

While port labour can relate to any port-related employment, in this paper we narrow down the focus to dock work only, i.e., labourers involved in the unloading and loading of cargo at seaport terminals. The framework is used to investigate examples of an array of innovative initiatives of terminal operators going beyond the traditional area of equipment innovation and automation (see section 4). The manuscript intends to broaden the boundaries of innovation studies in the port domain by focusing on those innovations directed to improve labour performance (e.g., new organizational solutions for dock labour).

Therefore, after the explanation of the methodological approach for the evaluation of port labour innovative initiatives, the paper proposes some empirical examples to test the proposed conceptual framework (see section 4).

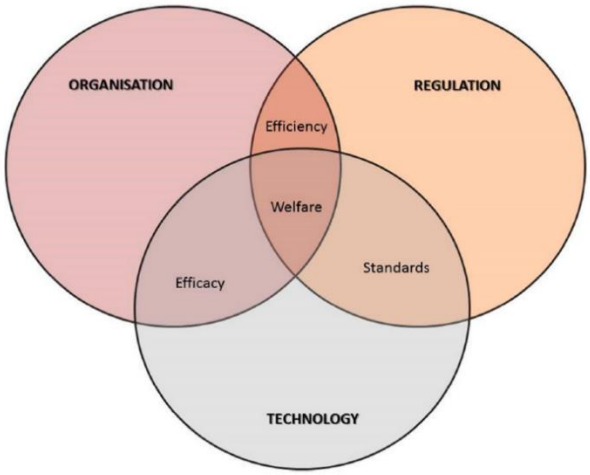
3.3.2.1. Classification and evaluation of innovative initiatives in the port domain

The first building block of the proposed methodological approach (i.e., classification and evaluation of innovative initiatives in the port domain) grounds on the work of Vanelslander et al. (2019) that examines innovations in the port domain, by using five dimensions: (i) the background of the innovation, (ii) the openness of the innovation, (iii) the actors involved, (iv) the source of innovation, and (v) the magnitude of the impact.

The first dimension (background of innovation) concerns the targeted goals of the innovative initiatives. Vanelslander et al. (2019) design a scheme with three innovation spheres (Figure 3.3): regulatory (institutional, policy or similar innovation types), organisational (management, system or similar innovations) and technological (product or process innovations). The originality consists of the mutual influence which triggers and fosters the innovation processes (e.g., the interrelation among “organisation” and “technology” explains how management, operational and cultural aspects deal with the introduction of new technological innovations). The second dimension (openness of innovation) outlines the presence of an “information sharing environment”. In particular, “closed innovation” refers to the attitude to keep the results of innovation activities within the firm; conversely, knowledge related to an “open innovation” is shared with the other member of the cluster (e.g., maritime cluster). While co-operation is a critical factor for the adoption and diffusion of innovative initiatives (see section 2), port-related

initiatives are mostly "closed innovations" due to the tendency of maritime firms to hide the outcomes of their successful initiatives and, thus, preserve their competitive position in the market. The third dimension (actors) grounds on the boundaries of the initiative. The authors make a distinction between "(Business) Unit Change" and "Market Change" to outline when a change occurs at a specific location (or involves one specific operator) and when it refers to the entire market. In particular, business or unit changes prevail over market changes in the port industry and, thus, the majority of innovative actions are confined to a single maritime terminal due to the complexity of aligning multiple actors' interests.

Figure 3.3. Background of innovation: targeted goals of the initiatives.



Source: based on Vanelslander et al. (2019)

When it comes to the fourth dimension (source of innovation) there are two possible alternatives: private commercial innovation, addressed to improve a firm's performance, and public innovation, aiming at increasing socio-economic welfare. As concerns the maritime and port industry, the sources of innovation also include public-private initiatives, even though most port innovations are private. This aspect further explains why most innovative initiatives are "closed". The last dimension (i.e., the magnitude of impact), describes the size of the impact of new innovative initiatives on the market/business. This dimension distinguishes "incremental innovations" (i.e., marginal improvements/implications), and "radical innovations", which are associated with drastic changes in the market/business but are less diffused in the port industry.

For the aim of the present study, we use four criteria (i.e., type of innovation, boundaries of innovation, nature of actors involved, and magnitude of impact) to classify and evaluate

innovative initiatives in the port domain (Figure 3.2). The "type of innovation" defines the background and the objectives of the action. We use three labels to classify the type of innovation, as follows: "regulation", which involves every change in the policy that can affect dockworkers and related tasks; "organisation", which is related to new organisational and managerial approaches to manage the port labour force (e.g., pool composition, shifts, assignment of tasks, etc.); "new technology", which regards the employment of new terminal equipment, ICT systems or digital technologies by terminal operators. The second criterion (i.e., "boundaries of innovation") examines if the innovation is confined to a single terminal (i.e., "unit change") or encompasses the whole port, or even multiple ports (i.e., "market change"). The "nature of actors involved" identifies the private, public or private-public nature of the innovators. This distinction is particularly relevant to have a better understanding of the objectives pursued by the innovation process. Finally, the fourth dimension (i.e., "magnitude of impact") outlines the (expected) impact of the innovative initiatives on the terminal/port. The conceptual framework makes a distinction between incremental and radical innovation.

3.3.2.2. Port labour performance

Innovative initiatives have proven to be critical for the growth strategies of terminal operators (De Martino et al., 2013). In particular, academics and practitioners tend to consider port labour initiatives essential to improve terminal performance since dockworkers productivity is strictly interrelated with port competitiveness (Trujillo and Nombela, 1999; Turnbull and Wass, 2000). Therefore, the second building block of our original conceptual framework (Figure 3.2) describes how to evaluate the improvement of port labour performance as a result of specific innovative initiatives of terminal operators (classified and evaluated in the previous step). In particular, the methodological approach involves the use of three indicators, as follows: (i) labour productivity, (ii) labour cost efficiency and (iii) qualitative aspects of labour.

According to the economic definition, labour productivity represents the value delivered to the firm by human capital and it is calculated as the total output divided by labour inputs. In the port domain, labour inputs are typically expressed in several working hours per employee or in the size of stevedoring pools deployed to handle cargo. Output refers to cargo volume handled per time unit (i.e., an hour, shift, week, month or year) or value-added created by dockers. Notably, input and output quantity can be formulated in alternative ways (e.g., using the output per man/hour or tons per gang/shift). The productivity of dockworkers employed at the quay (calculated as the tonnage loaded and discharged per dockworker/shift) relies on the number and

size of the gangs as well as the number and type of cranes and other equipment deployed to handle the vessel including their level of automation.

The second indicator of labour performance is cost-efficiency. According to Notteboom (2010), dock labour represents between 40% and 75% of total operating costs of general cargo terminals and 15% to 20% of dry bulk terminals in northwest European ports. While port terminals are increasingly automated and the industry is becoming more capital-intensive, dockworkers still cover a pivotal role in operational activities, absorbing a big portion of terminal operators' total expenditure (especially in the container and general cargo terminals). Therefore, labour cost efficiency is a critical goal for terminals operators since it significantly affects their capability to generate margins. In this perspective, terminal operators have to strike a balance between operating costs and labour performance: a reduction of salaries or a decrease in the number of workers does not always guarantee higher margins as these actions can result in a shortage of workers, strikes or other organisational and operational inefficiencies, which reduce the overall labour performance (Notteboom, 2018).

The last indicator deals with qualitative aspects of port labour that deeply affect terminal operators' logistics services. It is widely believed, low service reliability, dependability or flexibility of dockworkers deteriorates the capability of terminal operators to meet cost recovery targets and reduces the overall productivity and competitiveness (Notteboom, 2018). In particular, service reliability is undermined by different factors related to the labour organisation and the management of the workforce. For example, the shortage of gangs (or dockworkers) can cause substantial delays in vessel loading and discharging operations, generating a higher cost for shipping companies and lowering the quality of the service provided by the terminal operator. Moreover, a high number of accidents at work may reveal a lack of training or a low commitment to the job of a dockworker. Another element to consider are strikes that considerably reduce labour productivity and generate additional costs for all the members of the maritime cluster. Strikes typically emerge from disputes between terminal operators and dockworkers who require better employment contracts and working conditions.

In conclusion, terminal operators are challenged to design innovative initiatives that maximise dockworker performance in terms of productivity, cost efficiency and quality of the service provided.

3.4. Empirical examples of dock labour-focused innovation in the port industry

This section discusses some anecdotal evidence on innovative initiatives of terminal operators to test the original conceptual framework. We include recent examples of technological innovation in terminal equipment and automation, but also innovation in terms of organization and regulation. Notably, we select five innovative initiatives carried out in North European ports throughout the last decade, based on existing academic literature specialised in port management. Most of the examples are inspired by the array of current issues in dock labour systems as presented in Notteboom (2018) which includes relevant information about terminal operators' innovative initiatives. We focus on North European seaports since they are widely considered cutting-edge innovators by academics and practitioners of the industry. More, in particular, Tables 1 to 5 provide a structured analysis of the following innovations affecting dock labour in the port industry:

- The introduction of automated container terminals involving remotely-controlled quay cranes and automated yard and quay-to-yard equipment (Table 3.1);
- Change in the (legal) status of the dock worker (Table 3.2);
- The move towards more open and autonomous labour pool systems (Table 3.3);
- A push for continuous work (Table 3.4);
- Changes in dock labour hiring systems (Table 3.5).

Using the framework presented in Figure 3.2, the analysis provides insight into the type of innovation, the boundaries of innovation, the nature of the actors involved, the (expected) magnitude of impact and, finally, the (expected) implication on labour performance in terms of labour productivity, cost efficiency and quality of labour.

Table 3.1. The introduction of automated container terminals involving remotely-controlled quay cranes and automated yard and quay-to-yard equipment.

Anecdotal evidence	New APM Terminals container terminal at Maasvlakte 2 in Rotterdam (the Netherlands)
Type of innovation	**Technology:** with large ramifications on labour organisation
Boundaries of innovation	**Market change:** While full terminal automation is not widespread yet (only 3% of container terminals around the world have been automated – figures Drewry), there is a clear move to automation particularly in larger ports (e.g., Rotterdam, Hamburg).

Nature of actors involved	**Private:** Driven by global terminal operators such as APM Terminals, HutchisonPorts, PSA, DP World, TIL, Terminal Link
Magnitude of impact	**Radical:** Strong decrease in the number of required dock workers + change in the profile of quay crane operators (i.e., a shift from 'on-quay' labour to 'control room' labour). In this specific case, the new APM Terminals terminal development in Rotterdam faced strong opposition from local labour unions as they feared a possible loss of jobs and lower wages, given the shift from classical crane drivers to remote operators of automated cranes.
Labour performance (LP: labour productivity, CE: cost efficiency labour, QL: quality of labour)	**LP:** Dramatic increase due to strong increase in the ratio capital/labour-intensity of terminal operations **CE:** Relation between technology and cost efficiency depends on the benefit/cost ratio of investments in new terminal technology and the related reduction in labour costs. **QL:** depending on the reliability of technology; labour flexibility is a function of equipment operations; the lower number of dock workers does not exclude strikes and disruptions but implies fewer workers can have a large impact on operations.

Source: Authors' own elaboration

Table 3.2. Change in the (legal) status of the dock worker.

Anecdotal evidence	In many ports, only registered dock workers can perform dock work in the port (for example the Act Major in Belgian ports, see Notteboom 2010). This obligation can be imposed by national or regional legislation or might also be the outcome of collective bargaining agreements between port employers and trade unions. In some cases, like in the Belgian case, only one official dock worker pool in each port delivers recognized dock workers. The use of registered dockers through the pool is mandatory. Labour reform processes, pushed by European Commission rules, might aim to introduce competition among providers of registered dock work services.
Type of innovation	**Regulation:** with large ramifications on labour organisation.
Boundaries of innovation	**Market change:** The discussion on the legal status of the dock worker is European-wide and in many countries has already led to a more liberal approach to who can perform dock work. For example, the National Dock

	Labour Board (NDLB) in the United Kingdom was abolished in 1989. Most stevedoring companies now employ a core workforce and run their recruitment agencies to satisfy peaks in labour demand (Turnbull and Weston 1993). Belgium and Spain are among the countries where only recognized dock workers employed through dock labour schemes can perform dock work in the port.
Nature of actors involved	**Private or public:** Dock workers can be civil servants in state-owned service ports, workers directly employed by a private terminal operating company or workers employed through dock labour schemes. This implies the actors involved can be private or public.
Magnitude of impact	**Radical:** The UK case demonstrates that major changes in the legal status of the dock worker can have wide impacts on the organisation and operations of dock work. It is generally believed that the combination of privatization, increased capital investments and a plentiful supply of labour has contributed to the revitalisation of UK ports. In case a terminal operator is not happy with the current arrangements in terms of dock worker status in a port, he can push/lobby for regulatory change, opt for technological innovation to reduce labour dependency or move activities to a (neighbouring) port with more favourable labour conditions.
Labour performance **(LP: labour productivity, CE: cost efficiency labour, QL: quality of labour)**	**LP and CE:** While the productivity of port workers in UK ports has generally increased, Turnbull and Weston (1993) argue that UK ports are now 'locked in a vicious spiral of cost-cutting, based predominantly on reducing labour costs. In other cases, it is less clear how a change in dock worker status might affect LP and CE. Mitroussi and Notteboom (2015) point in this respect to the role of motivation in securing LP, next to the overall legal organisation of dock work and dock worker status. **QL:** it is believed that less strict rules on the dock worker status might pave the way to higher labour flexibility (combined with lower labour union power). At the same time, the European Transport Workers' Federation and individual labour unions consider cargo handling operations as highly dangerous operations that can only be done by trained and experienced workers. Relaxing rules on the dock worker status might therefore negatively impact safety.

Source: Authors' own elaboration

Table 3.3. The move towards more open and autonomous labour pool systems.

Anecdotal evidence	Dock work in many European ports is guided by a dock labour scheme using a centrally managed pool of registered dock workers. These dock labour schemes are based on systems of registered dock workers who are not permanently employed at particular stevedoring enterprises but hired through a central pool or hiring hall. In case there is not enough work available during a particular day or period, the registered dockworkers can rely on minimum pay guarantees or unemployment benefits. Employers and employees jointly determine the size of the docker workforce based on current and future needs. Many of the dock labour schemes in European ports have undergone small or significant changes to labour pool arrangements (see Notteboom, 2018 for a detailed analysis). In some cases, such as in Germany and the Netherlands, employers can hire permanent company employees directly from an external labour market, but any additional (casual) labour must be hired from a regulated labour pool. Overall, there is a general trend towards open and autonomous pool systems with a backup of temporary employment agencies. In some countries, such as Belgium and Spain, this process is much slower or even not taking place despite investigations and (legal) actions of the European Commission.
Type of innovation	Regulation and organisation
Boundaries of innovation	**Market change:** The move towards open and autonomous pool systems is European-wide, although the speed of progress differs between countries.
Nature of actors involved	**Private and public:** National governments typically are responsible for designing and implementing the general legal framework of the (national) port labour scheme. However, supranational (i.e., EU) guidelines and regulations/directives also have a key role to play. Processes of social dialogue between employers' organizations and labour unions not only provide input for the government's regulatory work but also outlines the more practical implementation of such schemes in the ports. Also, port authorities might (informally) influence the reform processes of dock labour systems and regulations.
Magnitude of impact	**Radical:** Major changes in the dock labour employment schemes generally have wide impacts on the organisation and operations of dock work. In case a terminal operator is not happy with the current dock labour scheme he can push/lobby for regulatory change, opt for technological innovation to

	reduce labour dependency or move activities to a (neighbouring) port with more favourable labour conditions.
Labour performance (LP: labour productivity, CE: cost efficiency labour, QL: quality of labour)	**LP and CE:** No studies are available that analyse the impact of a move towards an open and autonomous pool system on labour productivity. Anecdotal evidence demonstrates that some ports with a closed dock labour pool (such as the port of Antwerp) are known for their high labour productivity (measured in terms of tons/TEU handled per dock worker per shift). **QL:** One of the main incentives behind the establishment of dock labour pools is to guarantee flexibility in labour quantity to cope with possible high volatility in port activity. A move towards more open and autonomous pool systems can only be successful if solutions are found (for example through temporary labour offices) to deal with peaks and troughs in terminal activity in a cost-efficient way.

Source: Authors' own elaboration

Table 3.4. A push for continuous work.

Anecdotal evidence	Terminal operators are pushing for continuous work to meet the service availability (24h/7d) and reliability requirements of shipping lines. As a result, terminal operators in many European ports implement or try to implement operational changes such as individual rather than collective breaks, flexible start times and variable shift lengths. In some cases, such changes are blocked or made difficult by regulatory or operational barriers. For example, half shifts or continuous hiring (starting a shift at a preferred moment in time) are not possible in Antwerp. Another trend is the implementation of the so-called 'hot seat' change or the seamless transition from one shift to another which results in continuous work on a ship thereby reducing idle time of the handling equipment. Dock labour schemes show various ways of dealing with overtime, night shifts and weekend work. For example, in some ports weekend work is considered as a normal shift, while dockers in other ports have the freedom to accept weekend shifts (voluntary basis) with provisions in place for overtime money in case they do.
Type of innovation	Organisation, if needed, supported by regulatory changes

Boundaries of innovation	**Market change:** European-wide phenomenon, although the speed of progress and the intensity of implementation differs between ports.
Nature of actors involved	**Private (but public action often required):** Terminal operators are the main drivers behind the push for continuous work. However, in some cases, regulatory changes are needed requiring action from national or regional governments, for example when existing (sector-wide) labour regulations put heavy restrictions on night shifts and weekend work.
Magnitude of impact	**Incremental to radical:** The impact of the push for continuous work is very much dependent on the local circumstances in the port under consideration. When a terminal operator is dealing with a port that historically has very favourable operational and regulatory conditions in place to allow more continuous work then the impact will be incremental. In other cases, the implementation of continuous working processes at terminals requires a radical rethinking of the existing operational and regulatory environment.
Labour performance (LP: labour productivity, CE: cost efficiency labour, QL: quality of labour)	**LP and CE:** More continuous work can increase LP, particularly when (paid) non-productive time is turned into productive time (e.g., hot seat change). The most important benefit of continuous work is that expensive capital assets (such as cranes) end up having far less idle time which improves the cost efficiency of these assets. **QL:** A move towards more continuous work does not necessarily improve the quality of labour. Some labour unions warn that it leads to increased pressure on the workers and stimulates fatigue (which can increase the accident risk). Therefore, when implementing continuous work practices, terminal operators are challenged to develop a range of additional measures to guarantee work motivation and to avoid any safety issues.

Source: Authors' own elaboration

Table 3.5. Changes in dock labour hiring systems.

Anecdotal evidence	Dock labour schemes in ports often go hand in hand with very specific hiring methods, particularly in case a pool of registered dock workers exists. Notteboom (2010) describes how hiring systems in European ports can differ in terms of (a) the hiring moment (e.g. hiring at fixed moments per week day or continuously), (b) the persons involved in the hiring process (e.g. foreman, company officials); (c) the characteristics and

	governance of the supervisory system; (d) the interaction between docker and hiring person/entity (e.g. physical in a hiring hall or via electronic systems); (e) the control given to the docker (e.g. matching voluntarily or controlled externally with or without taking into account the preferences of dockers). Technological advances in mobile communication have facilitated the modernization of job assignment systems towards electronic dispatching of dock workers in ports or terminals. The use of physical hiring halls is therefore becoming very rare.
Type of innovation	**Organisation**, if needed, supported by regulatory changes and technology (e.g., electronic hiring)
Boundaries of innovation	**Market change:** European-wide phenomenon, although the speed of progress and the intensity of implementation differs between ports.
Nature of actors involved	**Private (but public action might be required):** Employers' organisations and labour unions are the actors involved in proposing and implementing changes in the hiring systems. However, in some cases, regulatory changes are needed requiring action from national or regional governments.
Magnitude of impact	**Incremental:** In most cases, a change in the hiring system does not fundamentally alter the overall dock labour conditions and systems in the port. However, it can have an impact on more social dimensions of the life of a dock worker. For example, casual dock workers in the port of Antwerp used to be hired during four daily sessions at a central hiring hall near the city (note that about two-thirds of all casual dockers in Antwerp are effectively quasi-permanent or semi-regular, working for the same employer regularly via a 'repeat hiring' by a regular employer). A few years ago, the hiring hall was replaced by a system of electronic hiring. This new hiring method brings a more efficient matching of supply and demand and avoids dock workers having to commute to the hiring hall. However, it also made an end to the centuries-old function of the hiring hall as a place of social exchanges among dockers and employers.
Labour performance (LP: labour productivity, CE: cost efficiency labour, QL: quality of labour)	**LP and CE:** impact expected to be limited. **QL:** impact expected to be limited.

Source: Authors' own elaboration

3.5. Conclusions

The market environment of ports and terminals is continuously pushing terminal operators to achieve higher levels of dock labour performance. This pressure has direct implications on the requirements for dock labour arrangements and employment systems and has intensified the search for technological, organisational and regulatory innovative solutions. This paper proposed an original conceptual framework to identify, classify and evaluate innovative initiatives of terminal operators addressed to enhance port labour performance and meet the ever more stringent market requirements. This paper contributes to existing dock labour literature by linking the innovation concept to a market-driven perspective on the organization of dock work in light of changing market requirements. By focusing on those innovations directed to improve labour performance, this study also broadens the boundaries of innovation studies in the port domain. We did not only consider technological innovations but also incorporated organisational and regulatory innovation in the presented conceptual approach and their potential impact on port labour performance.

The methodological framework was used to analyse a set of innovative initiatives of terminal operators: the introduction of automated container terminals; a change in the (legal) status of the dock worker; the move towards more open and autonomous labour pool systems; a push for continuous work, and changes in dock labour hiring systems.

The results show that innovative initiatives can have very different characteristics and ramifications when looking at the type of innovation, the boundaries of innovation, the nature of the actors involved, the (expected) magnitude of impact and the impact of labour performance in terms of labour productivity, cost efficiency and quality of labour. The study also underlines that organisational and regulatory innovation, next to technology, has a key role to play in achieving a higher labour performance.

Port actors should also acknowledge the strong interdependency among the types of innovation. Organisational innovation often requires supporting actions in the field of regulation and new technological solutions. In this perspective, the relation between the three types of innovation is not univocal. For example, an inefficient and costly dock labour system in a port might give impetus to terminal operators to opt for terminal automation. However, the benefits of automation partly depend on whether or not the technological innovation enables the terminal operator to reduce the workforce and achieve significant savings in labour costs. The existing organisational and regulatory arrangements in terms of dock labour might undermine the operator’s opportunity to fully reap such benefits of automation. Thus, terminal automation often requires some regulatory and operational innovations as well.

Another finding is that the majority of the discussed innovations relate to radical market changes, not an incremental unit change. This implies that the transformations the port industry is going through are widespread across ports and generate fundamental impacts that potentially change the face of the port/terminal scene.

Finally, the analysis also demonstrated that the impact of the discussed innovations on labour performance (in terms of labour productivity, cost efficiency labour and quality of labour) is difficult to measure and complex in nature, particularly when focusing on the quality of labour dimension. Organisational changes can lead to increased pressure on the workers, and higher risks of accidents and fatigue. Terminal operators are challenged to develop a range of additional measures to guarantee work motivation and to avoid any safety issues. This supports the idea that terminal operators cannot only focus on hard economic aspects of innovation when trying to improve labour performance but also should incorporate softer social aspects in innovation processes such as dock worker motivation, commitment, social interaction and the need for social dialogue. In addition, terminal operators are expected to invest in *ad-hoc* courses for training multi-skilled dockworkers who can be able to cover diverse jobs and perform various tasks. Through this way, they can also meet the recent demand for highly skilled and educated workers triggered by the introduction and diffusion of new equipment and digital technologies embedded in the paradigm of Industry 4.0.

This study contains several limitations and opens avenues for future research. First, while the conceptual framework in principle can be applied to ports around the world, the external validity of the empirical application is limited. Each port region has specific characteristics in terms of market environment, governance structure, level of inter-port competition and port labour organisation and associated regulatory framework. These differences may require some specific adjustments to evaluate the implications on workers involved in the industry. Second, the empirical analysis included an application of the conceptual framework of five different innovative initiatives related to dock labour. While these selected initiatives brought forward some interesting findings on how innovation affects dock labour, there are also other innovations in the port industry which affect dock labour. For example, advances in data mining techniques helped global terminal operators to develop an increased focus on performance measurement and benchmarking among the terminals within their network. Future research can focus on how innovations at the terminal level are shared in such global terminal networks and on how these innovations and benchmarking practices affect dock labour performance targets and arrangements at the local level. Third, the conceptual framework was empirically supported by evidence on dock labour in European ports. However, the relationships have not been empirically quantified. We believe there is room for such a quantification, but this assumes that difficulties in obtaining

non-publicly available data on dock labour performance can be overcome. Next, there is room for extending the port sample to other regions around the world, so that a more global view can be developed on the relations (and potential regional differences) between innovation and dock labour performance.

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CHAPTER 4

DIGITAL TECHNOLOGIES AND BUSINESS OPPORTUNITIES FOR LOGISTICS CENTRES IN MARITIME SUPPLY CHAINSHE

4. Digital technologies and business opportunities for logistics centres in maritime supply chains

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Abstract

The study investigates how the adoption of emerging digital technologies can provide valuable business opportunities for logistics centres in maritime supply chains. For this purpose, a systematic literature review (SLR) of prior academic studies addressing this topic is performed. The review unveils the current lack of a comprehensive framework to assess the impact of digital technologies on transport and maritime logistics, bringing insights for a promising research agenda. The paper proposes an ad-hoc conceptual framework for disentangling relevant business opportunities which originates from the adoption of cutting-edge digital technologies for each type of logistics centres. The main business benefits for logistics infrastructures that manage cargo flows in maritime supply chains (MSCs) are identified and discussed. The results suggest alternative strategic options for innovating logistics chains and increase the competitiveness of various cargo logistics centres. Managerial and marketing implications for both academics and practitioners are discussed in-depth.

Keywords: logistics centres; maritime supply chain; digital technologies; business opportunities; digital innovation.

4.1. Introduction

Digital innovation is shaping the architecture of maritime supply chains (Carlan et al., 2017; Cariou, 2018). Operational efficiency and costs reduction as well as strengthening of the decision-making process and stakeholder relationship management (SRM) are just some of the business benefits that digital technologies of Industry 4.0 offer to logistics centres embedded in maritime supply chains (MSCs), including port terminals, distribution centres, intermodal terminals and dry ports (Lee et al., 2016; Haddud et al., 2017; Heilig and Voß, 2017; Arunachalam, Kumar and Kawalek, 2018). Among the most promising technologies, scholars agree that IoT platforms, cloud computing and blockchain will be potentially disruptive for the sector (Cariou, 2018). Their implementation enables to unbundle information flows from related physical cargo flows and to digitally share data among the actors involved in MSCs (Bruque Camara, Moyano Fuentes and Maqueira Marin, 2015; Molano, Bravo and Trujillo, 2017). This promotes a collaborative attitude and supports the creation of wider logistics networks (Abdel-Basset, Manogaran, and Mohamed, 2018). Digital technologies also ensure the effective storage of manufacturing goods and commodities both in port terminals and hinterland logistics centres, reducing transit times and maximizing cargo value (Wamba et al., 2008; Du and Bergqvist, 2010; De Langen, and Douma, 2010). Furthermore, logistics service providers (LSPs) benefit from these innovations because they can extend the array and quality of ancillary services ensured to vehicles, firms and people (Higgins, Ferguson and Kanaroglou, 2012; Büyüközkan and Göçer, 2018).

Recent studies have investigated the key drivers of logistics centres' attractiveness (see e.g., Notteboom et al., 2017). Carlan et al. (2017) emphasize the growing relevance of information and communication technologies' infrastructural endowment (e.g., electronic data interchange, applications for monitoring of vehicles and cargo, and for supporting cargo flows), which significantly contribute to the competitiveness of maritime-related logistics centres. ICT systems, and promptly digital technologies, generate valuable business opportunities for both service differentiation and cost-saving in various logistics activities, including cargo handling, warehouse management, track and trace operations, sales activities, safety and security and payment methods (Marchet, Perego and Perotti, 2009; De Langen and Douma, 2010; Cariou, 2018). Additionally, they facilitate the collaboration among the heterogeneous actors of MSCs, fostering networking and marketing as well as stakeholder relationship management (Bellingkrodt and Wallenburg, 2013; Abdel-Basset, Manogaran, and Mohamed, 2018).

Based on the above considerations, many scholars recognize the beneficial effects of digital technologies on logistics centres' business model and strategies (see e.g., Carlan et al., 2017; Cariou, 2018). However, the implications are not the same for every logistics node which is thus

called to identify the most suitable innovations for their business. Previous studies, indeed, outline different typologies of logistics centres embedded in MSCs according to their features and distinctive key success factors (Rimienė and Grundey, 2007; Higgins, Ferguson and Kanaroglou, 2012; Notteboom et al., 2017). Consequently, an array of heterogeneous opportunities and threats emerge from the combination of different digital technologies with each typology of the logistics centre.

Although the complex and multifaceted nature of (maritime-related) logistics centres constitute a valuable empirical domain for assessing the prominent trajectories of digital innovation, only a few managerial studies have investigated how digital technologies of Industry 4.0 are shaping the competitive environment of MSCs. In this vein, most academic papers mainly address engineering and technical issues, leaving several rooms for further research along with a managerial or marketing perspective (Bellingkrodt and Wallenburg, 2013; Cariou, 2018; Arunachalam, Kumar and Kawalek, 2018).

In light of the above, the objective of the paper is twofold:

- **Research Objective 1 (RO1)**. To perform a systematic literature review (SLR) of academic papers addressing the adoption of emerging digital technologies by the logistics centres of MSCs to comprehend the state of the art.
- **Research Objective 2 (RO2)**. To identify the main business benefits emerging from the literature review and to assess managerial and marketing opportunities for the different typologies of logistics centres in MSCs.

The SLR examines more than 100 academic papers published in leading international journals of port and maritime management (e.g., Maritime Policy & Management and Research in Transportation Business and Management), transport and logistics (e.g., Transportation Research Part E: Logistics and Transportation Review and Journal of Business Logistics), supply chain management (e.g., Supply Chain Management), innovation and computer science (e.g., Journal of Manufacturing Technology Management and Transportation Research, Part C: Emerging Technologies). Then, both managerial and marketing opportunities are explored through the application of an original conceptual framework, grounding on the theoretical construct of Abell's matrix (1980). The conceptual framework enables to disentangle these potential business benefits combing the most promising digital technologies for the industry with the different typologies of logistics centres in MSCs.

The paper is structured as follows. Section 2 defines the theoretical foundations of the study. First, it provides a taxonomy and a description of the logistics centres embedded in MSCs according to the functional criterion of Notteboom et al. (2017). Second, the most promising digital technologies of Industry 4.0 for maritime logistics are debated and commented. Section 3 outlines the proposed multi-layered conceptual framework based on Abell's matrix (1980). Moreover, it describes the methodology applied to perform the SLR and the sample of selected papers. In Section 4, the results of the study are reported, also proposing an application of the multi-layered conceptual framework. Finally, Section 5 addresses the managerial implications of the study before drawing further academic research avenues and concluding.

4.2. Theoretical foundations

4.2.1. Logistics centres of maritime supply chains: definition and taxonomy

Logistics centres are pivotal nodes in MSCs because they perform and facilitate all the activities related to transport, logistics and goods distribution (Notteboom and Rodrigue, 2005; Flämig and Hesse, 2011). Given the ongoing globalisation and the rise of cargo flows, logistics centres are no longer considered only facilitators of the transportation system, but also generators of economic growth and business opportunities (Notteboom and Rodrigue, 2005). This evolutionary process along with the emergence of additional services has made harder to classify these infrastructures through a univocal criterion (Rimienė and Grundey, 2007; Higgins, Ferguson and Kanaroglou, 2012). For the objective of the study, we use the overarching taxonomy proposed by Notteboom et al. (2017) which relies on the primary function of logistics centres within MSCs. It consists of three typologies, as follows: (i) logistics centres focused on storage, deposit and warehousing; (ii) logistics centres focused on cargo transloading and rapid transit; (iii) logistics centres focused on VAS and soft/light manufacturing. This taxonomy turns out to be particularly suitable to investigate the impact of digital technologies on each typology of logistics centres because it captures their intrinsic nature and role within the MSC. Accordingly, a summary of the main features and characteristics of all three typologies is detailed below.

Logistics centres of the first typology rely on basic facilities characterised by a low/medium level of infrastructural and managerial complexity. Warehouses and deposits represent buffering nodes of the logistics network. They support the inventory management of suppliers, producers and customers of the supply chain (Higgins, Ferguson and Kanaroglou, 2012). When it comes to the maritime domain, this typology includes, among others, container yards/inland container depots, that provide primary services related to storage, cleaning, maintenance and repair of empty containers, and distribution centres, which combine cargo storage activities with handling

functions. Distribution centres collect and split shipments from different origins and then, send cargo toward various destinations, supporting the organisation of transport and logistics network. For this purpose, they require suitable ICT platforms aiming at managing the multitude of orders and related physical and information flows (Kia, Shayan and Ghotb, 2003).

The second typology (i.e., logistics centres focused on cargo transloading and rapid transit) stresses the reduction of timing requested for completing the long-haul transports, by receiving and dispatching goods in the fastest way. Relatedly, the monomodal or intermodal nature of these logistics services significantly affects transport efficiency, especially when they are embedded in MSCs (Flämig and Hesse, 2011). Monomodal or multimodal nodes include, among others, inland (freight) terminals and intra-modal gateways which are normally specialised in a certain commodity chain (e.g., perishable goods, value-added products or time-sensitive goods). They are primarily focused on reaching major economies of scale, providing basic transloading services (Notteboom et al., 2017). Conversely, intermodal terminals deal with road-and-rail logistics services based on a single-plant facility (Rimienė and Grundey, 2007). This category also includes port terminals that are pivotal nodes for the entire MSC (see e.g., Keceli, 2011). Given the expansion of international commercial trade and due to the reconfiguration of continental distribution systems (Notteboom and Rodrigue, 2005), intermodal terminals such as dry ports are acquiring a critical role in MSCs. They can relieve ports from the lack of available storage area and, thus, from risks related to queuing and bottlenecks of maritime cargo flows.

The last typology of logistics centres includes logistics centres focused on the provision of value-added services and soft/light manufacturing to goods, vehicles, firms and people (Du and Bergqvist, 2010). Based on their characteristics and business models, Notteboom et al. (2017) identify two main sub-typologies: (i) freight village and (ii) special zones. A freight village is the hub of various national and international transport and logistics activities that are carried out by different operators (Rimienė and Grundey, 2007). The availability of public facilities and equipment, managed on a common-user base, constitutes a valuable precondition for this type of logistics centres (Du and Bergqvist, 2010). Freight villages consist of an agglomeration of co-localised logistics operators that offer complementary and auxiliary services to logistics actors. They are becoming fundamental within complex maritime-related supply chains. Among them, distriparks cover a pivotal role in the MSC since they are directly connected with seaport terminals (Notteboom et al., 2017). When it comes to special zones, they are generally large areas characterised by favourable regulations addressed to stimulate co-location of logistics infrastructure, manufacturers and LSPs. In particular, special zones are used by central or regional governments to foster international trade and to attract foreign investments, especially in the port area.

4.2.2. Emerging digital technologies in maritime logistics

Digital innovation has reshaped the rules of the maritime logistics industry (Carlan et al., 2017; Cariou, 2018). The implementation of new digital technologies and automated systems, indeed, is improving productivity, labour working conditions, quality of strategic plans and communication strategies of MSC actors (Lee, Tongzon and Kim, 2016; Molano, Bravo and Trujillo, 2017; Büyüközkan and Göçer, 2018; Notteboom and Vitellaro, 2019). The digitisation journey is already underway and both scholars and practitioners believe it will accelerate in the next years ahead (Molano, Bravo and Trujillo, 2017). In this perspective, a study of PwC (2016) reports the industry is investing approximately 5% of annual revenue in new digital technologies to innovate the business and make the MSC more competitive.

According to leading academic papers (Lee, Tongzon and Kim, 2016; Molano, Bravo and Trujillo, 2017; Carlan et al., 2017; Cariou, 2018; Büyüközkan and Göçer, 2018) and reports by consulting firms (Deloitte, 2015; PwC, 2016), the most promising digital technologies for MSCs are the following: 3D printing (3DP), Human Machine Interface (HMI), augmented reality (AR), Automated Systems (ASs), Big Data Analytics (BDA), Blockchain Technology (BT), Cloud Computing (CC), Internet of Things (IoT), Location Detection technologies (LDs), Mobile devices (MDs), Multilevel Customer Interaction (MCI), Customer Profiling (CP) and Smart Sensors (SSs).

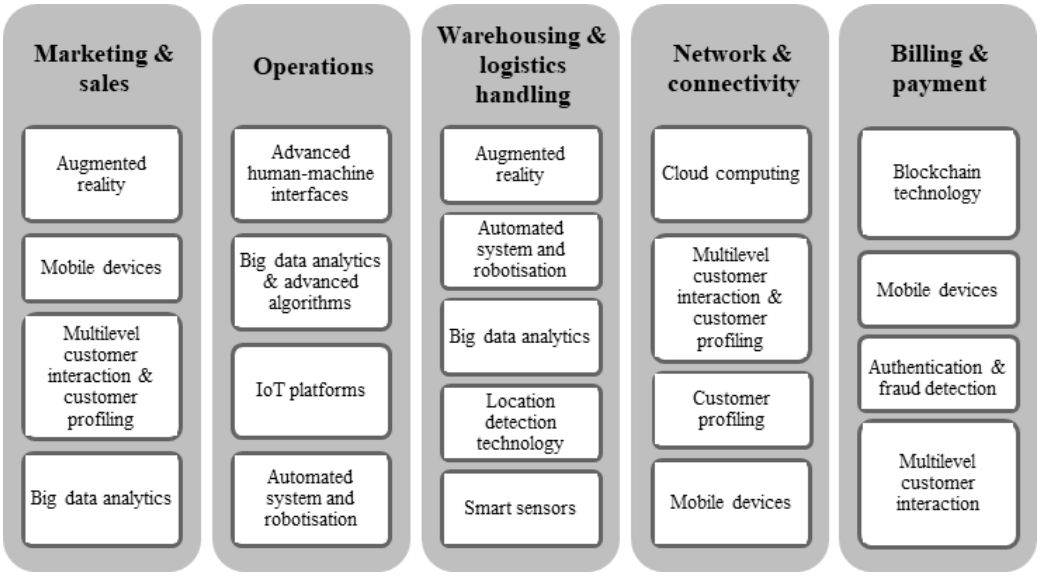
Although some of the debated technologies are still under development and currently stand for only prototypes (e.g., AR and 3DP), IoT, CC, LDs and BDA have proven to be more mature for the maritime logistics industry (Haddud et al., 2017; Cariou, 2018; Büyüközkan and Göçer, 2018). IoT is a global infrastructure that enables advanced services by interconnecting physical and virtual things as well as humans through interoperable information and communication technologies (Bassi et al., 2013). Physical devices, such as mobile phones, machines and smart sensors, are constantly connected with humans and the working environment, improving the performance of logistics companies (Venkatesan, Maragatham and Lavanya, 2016). Moreover, IoT allows monitoring every cargo handling and operation within logistics centres aiming at taking prompt actions to solve accidents or bottlenecks (Haddud et al., 2017).

When it comes to CC, it enables authorized users to simultaneously access the online platform from different devices (e.g., mobile phones, tablets, laptops, and workstations) and enjoy real-time services, such as networks, servers, storage, applications. CC is also designed to be elastic and scalable for meeting instantly the demand needs. These characteristics have determined a rapid growth of cloud technology within the logistics industry (Bruque Camara, Moyano Fuentes and Maqueira Marin, 2015). Relatedly, LSPs can use online platform services and tools to

organize cargo handling, transportation, freight forwarding, customs clearance, warehousing, and finally distribution activities. The explosion of e-commerce in China and western countries contributes to the wide diffusion of this technology (Hsiao, 2008). The fragmentation of shipping activities, which is no longer linked to a specific time and/or location, require, indeed, additional coordination activities.

LDs are included among the first digital innovations introduced in the business (De Langen and Douma, 2010; Abdel-Basset, Manogaran, and Mohamed, 2018). They monitor the geographic position of individuals, vehicles and cargo through electronic devices, including smartphones and laptop computers. In this perspective, LDs support logistics centres in all procurement and storage activities, by reducing the time required to find the goods inside the warehouse as well as preparing items for dispatching. In addition, location data related to vehicles and cargo flows, provide valuable insights to logistics centre managers when assuming strategic decisions (James, 2004).

Figure 4.1. Digital technologies and logistics centres' activities.



Source: authors' own elaboration

The ongoing digitisation process, indeed, has been improving the relevance of data for the logistics industry (Arunachalam, Kumar and Kawalek, 2018). Nowadays, data management appears pivotal for demand forecasting, improving inventory planning, warehouse management and distribution systems (Vásquez Rojas et al., 2018). In this vein, not only do logistic centres get

the opportunity to increase their management flexibility but also, they can develop the competencies to meet rapidly customers' requirements. Hence, BD offers logistics centres the opportunity to enhance the efficiency and the quality of their services, in terms of both customer experience and service customisation (Arunachalam, Kumar and Kawalek, 2018; Büyüközkan and Göçer, 2018).

In conclusion, Figure 4.1 summarises some of the main applications of enabling digital technologies in logistics centres' activities, i.e., marketing and sales, operations, warehouse and logistics handling, network and connectivity, and billing and payment (Cariou, 2018; Büyüközkan and Göçer, 2018).

4.3. Data and methodology

4.3.1. Conceptual framework

Although academics and practitioners agree on the most promising digital technologies for maritime logistics in the next future, a deeper analysis is required to go further their features and expectations and to disentangle the main business opportunities for logistics centres of MSCs.

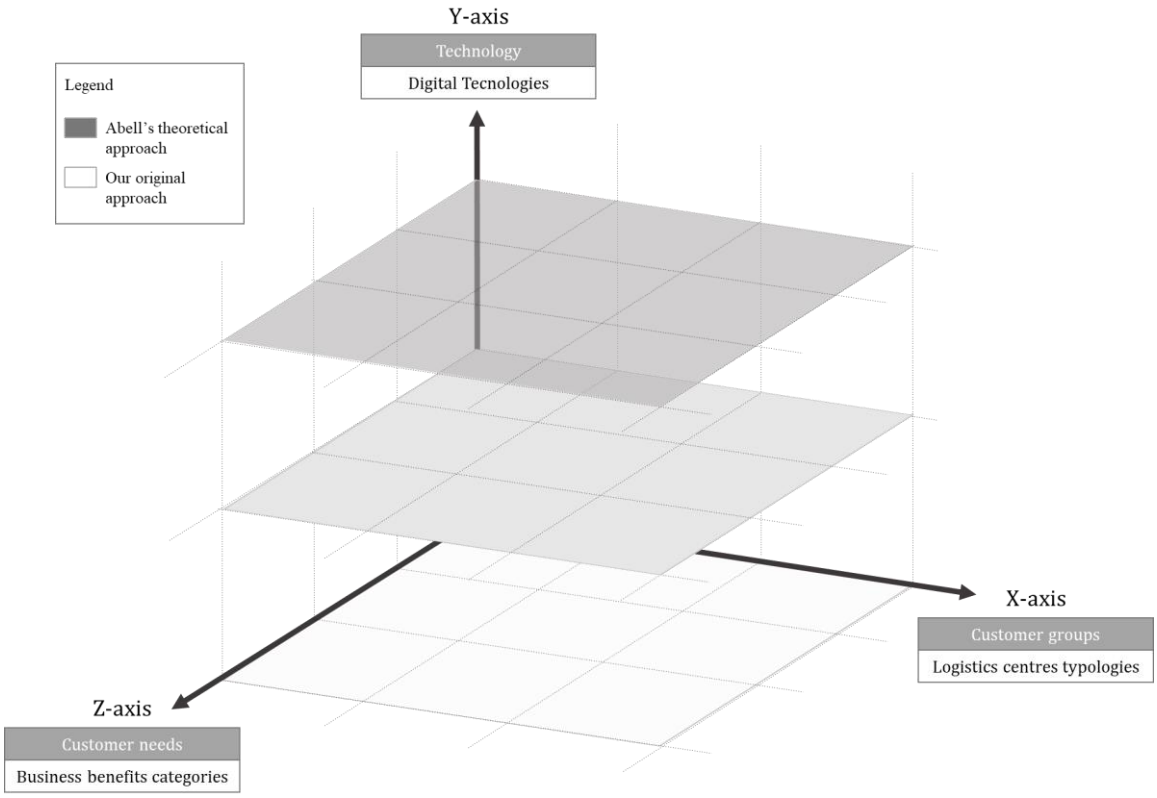
In his outstanding work, Abell (1980) proposes a three-dimensional model (i.e., Abell's matrix) to analyse the strategic planning process of the business. The author argues a business can be outlined in three dimensions, respectively customer groups, customer needs and technologies, that describe how the firm meets the requirements of its customers. Each combination of these dimensions (i.e., strategic business unit) highlights the competitive scope and the extent of the business opportunities related to the firm's strategy. In this perspective, Abell's theoretical approach turns out to be suitable to address the objective of the paper.

Figure 4.2 shows our theoretical approach based on Abell's matrix (1980). We consider logistics centres as "customers" of new potential digital technologies, whereas the dimension "technologies" turns into "digital technologies" referring to the main innovations of Industry 4.0 addressed to maritime logistics. Finally, the dimension "customer needs" is adapted to identify the prominent categories of potential business benefits sought by logistics centres when introducing new technologies in their operations and processes.

According to these theoretical premises, we develop a multi-layered conceptual framework (Figure 4.3). On the X-axis we outline three-layers referring to the taxonomy of logistics centres illustrated in sub-section 2.1, namely (i) logistics centres focused on storage, deposit and warehousing, (ii) logistics centres focused on cargo transloading and rapid transit, and (iii) logistics centres focused on VAS and soft/light manufacturing. In line with sub-section 2.2, on

the Y-axis are reported the 13 prominent digital technologies that are expected to shape the maritime logistics industry.

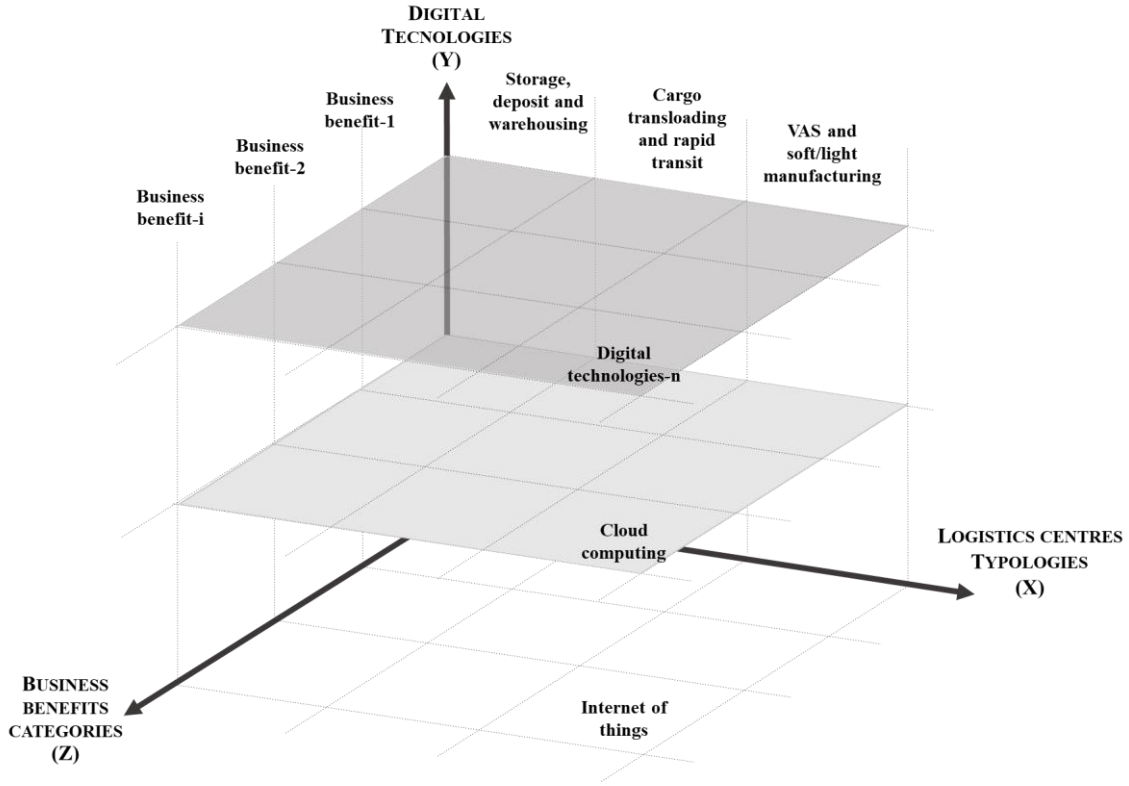
Figure 4.2. The theoretical approach.



Source: authors' own elaboration

Finally, on the Z-axis we draw *i* categories of theoretical business benefits originating from digital technologies. Since prior academic contributions have not proposed yet an overarching taxonomy of business benefits, the number of categories ranges from 1 to *i*, where *i* is the infinite number of potential benefits recognisable. Therefore, after reviewing academic literature we address this gap by suggesting an original taxonomy of business benefits to be reported in our conceptual framework.

Figure 4.3. The multi-layered conceptual framework.[5]



Source: authors' own elaboration

4.3.2. Systematic literature review

In line with RO1 and RO2, the paper carries out a systematic review of academic literature performing a three-stage procedure divided into (i) planning, (ii) execution and (iii) reporting (Tranfield, Denyer and Smart, 2003; Crossan and Apaydin, 2010).

The planning stage defines the boundaries of review. For this purpose, we use the Scopus database (provided by Elsevier) as a research engine to select the most promising academic papers. In addition, to ensure homogeneity and consistency, conference papers, books and PhD dissertations are excluded from the sample. In the second stage (i.e., execution), the paper defines the initial selection criteria. We perform ad-hoc queries using a different string of words in the research engine of Scopus (Elsevier). Relatedly, we define four groups of search terms, which include several alternative keywords, as follows:

i. the type of logistics centre related to MSCs (e.g., “port terminal”, “logistics centre”,

[5] We scrutinised 13 digital technologies (n = 13), see sub-section 2.2 for more details.

"distribution centre" and "intermodal terminal");

ii. the innovative dimension of the digital technology investigated (e.g., incremental vs. disruptive);

iii. the 13 most promising digital technologies for the maritime logistics industry (see, the detailed list in sub-section 2.2); in this case, we adopt diverse synonyms and abbreviations to be sure to capture the selected technologies (e.g., "internet of things" and "IoT");

iv. the managerial and marketing dimensions (e.g., "customer", "user" and "marketing").

As a result, seventy queries are performed, driving to the first sample of 392 papers potentially relevant for the study, published on 227 academic journals, which cover a 27-year timeframe (1991-2018). The high number of sources proves the heterogeneity of academic perspectives applicable to this novel and cutting-edge topic which is growingly debated by scholars and experts from various fields of research including, e.g., business and management, economics, engineering, computer sciences, social sciences, environmental sciences and energy. For strengthening the consistency of the sample, we further screen selected papers according to three additional parameters: (a) the actual pertinence to the research topic, (b) the scientific impact on future research, and (c) the year of publication. As regards the latter parameter, we narrow the timeframe to 10 years, from 2007 to 2018 (first quarter), to select the most novel papers concerning digital innovation. All the authors scrutinize each of the 392 sample papers' abstracts and they individually assign the label "pertinent" only to those papers that meet the three parameters. Abstracts that do not receive at least three "pertinent" labels are eliminated from the sample. Consequently, 116 papers are defined as "pertinent" for the objective of the study. Then, the authors entirely read the papers of this shortlist and replicate the aforementioned label assignment procedure. As a result, the final sample consists of 44 papers, published in 29 international journals (Table 4.1) from 2007 to 2018 (first quarter).

To conclude the second stage of the SLR, we carefully classify and systematize selected papers according to the following dimensions: authors' name, journal, year of publication, main topics, theoretical perspective (if applicable), paper type (e.g., conceptual paper, qualitative or quantitative research paper, etc.), method (e.g., theory-building, multiple case study, regression model, etc.), temporal coverage and logistic centre typology/sub-typology. Moreover, we report the digital technologies and related business benefits which arise from each sample paper.

The last stage of the SLR (i.e., reporting) consists of the results reported in Section 4.

Table 4.1. Journal included in the final sample of selected papers.

Source title	*No. of papers*
International Journal of Production Economics	6
Journal of Business Logistics	3
Maritime Policy & Management	2
Information Technology and Management	2
IEEE Access	2
International Journal of Physical Distribution and Logistics Management	2
Industrial Management and Data Systems	2
Transportation Research Part E: Logistics and Transportation Review	2
Information Systems Frontiers	2
International Journal of Engineering Business Management	2
Journal of Manufacturing Technology Management	1
Technological Forecasting and Social Change	1
NETNOMICS: Economic Research and Electronic Networking	1
International Journal of Transport Economics	1
Flexible Services and Manufacturing Journal	1
Research in Transportation Economics	1
International Journal of Advanced Manufacturing Technology	1
Electronic Markets	1
International Journal of Distributed Sensor Networks	1
Indian Journal of Science and Technology	1
Advanced Engineering Informatics	1
Research in Transportation Business and Management	1
International Journal of Logistics Management	1
Supply Chain Management	1
Future Generation Computer Systems	1
Transportation Research Part C: Emerging Technologies	1
Computers and Operations Research	1
Expert Systems with Applications	1
International Journal of Retail and Distribution Management	1
Overall sample	44

Source: Authors' own elaboration

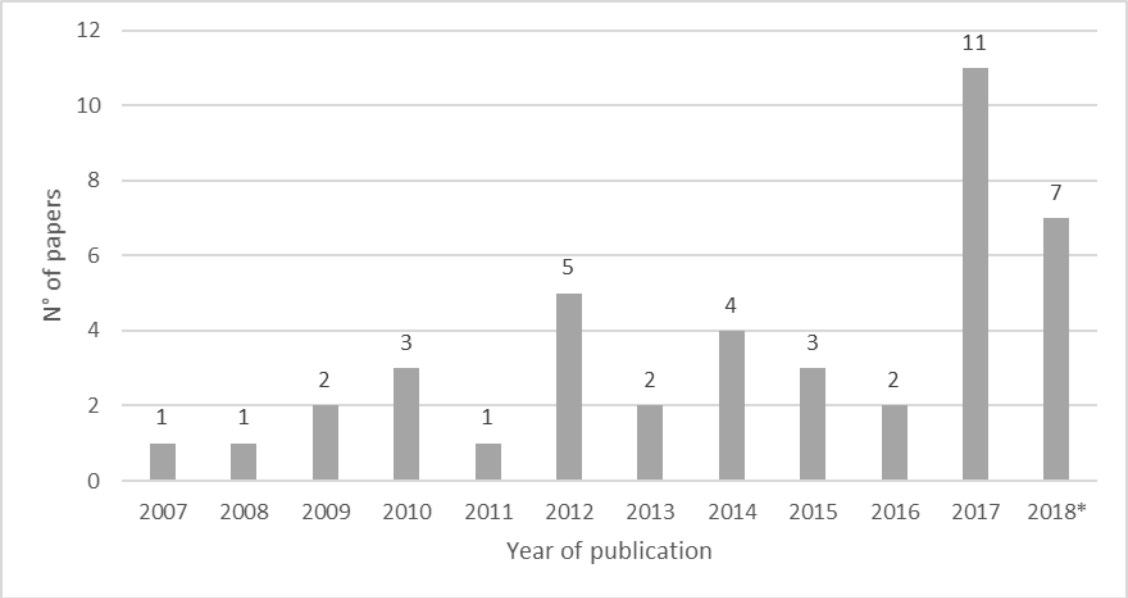
4.4. Results

4.4.1. Mainstream research in academia and literature gaps

Consistent with RO1, we first debate the most significant issues emerging from the SLR, which offers valuable insights into current academic knowledge on the adoption of emerging digital technologies in logistics centres of MSCs.

Firstly, the paper examines the temporal distribution of selected papers (Figure 4.4). The sample covers a period of 11 years, drawing attention to the novelty and the cutting-edge nature of the research. In particular, 18 out of 44 (41%) studies were published in the last two years, unveiling the increasing attention of scholars on this topic.

Figure 4.4. Temporal distribution of the sample papers.



Source: Authors' elaboration

When it comes to the analysis of the paper type and research methods (Table 4.2), the sample papers are predominantly conceptual or qualitative studies.

In detail, 38.6% of the selected studies are conceptual papers (17), including 13 new conceptual frameworks and 4 theory-building approaches. Qualitative research papers (27.3% of the sample) consistent with single and multiple case studies (respectively, 9 and 3 papers), which are particularly relevant for the analysis since they report empirical evidence of digital technologies in the logistics domain. As regards quantitative research papers (25.0%), it appears as a heterogeneous category: structural equation modelling (4 papers), regression model (2), costs/benefits analysis (1) and simulation model (1) are just some of the methodologies applied in this category. What emerges is the lack of this kind of paper in literature since they can considerably foster academic knowledge by making use of the impressive quantity and quality of available data concerning logistics flows in MSCs. Finally, literature review papers are rather scarce (only 4 cases, 9.1% of the sample). It suggests the urgency for additional efforts in

systematizing past research to pave the ground for future studies on the use of emerging digital technologies in the logistics and supply chain domain.

Table 4.2. Paper type and research methods.

Paper type and methods	*No. of papers*	*% On the sample*
Conceptual paper	*17*	*38,6%*
Conceptual framework	13	*29,5%*
Theory building	4	*9,1%*
Research paper (qualitative)	*12*	*27,3%*
Single case study	9	*20,5%*
Multiple case study	3	*6,8%*
Research paper (quantitative)	*11*	*25,0%*
Structural Equation Modelling (SEM)	4	*9,1%*
Regression model	2	*4,5%*
SIRS epidemic model-deterministic and stochastic models	1	*2,3%*
Discrete event simulation	1	*2,3%*
Costs/Benefits analysis	1	*2,3%*
Casual Loop Diagram & System Dynamics	1	*2,3%*
Simulation models (controlled arrival method)	1	*2,3%*
Literature review	*4*	*9,1%*
Systematic literature review	2	*4,5%*
Literature review	2	*4,5%*
Overall sample	*44*	*100,0%*

Source: Authors' elaboration

Many authors propose alternative models and theories for investigating some of the potential implications related to the adoption of emerging digital technologies by logistics centres. This result stresses once again the originality and the novelty of the present research topic. The examination of theoretical perspectives (Table 4.3) shows that the supply chain management perspective (SCM) is the dominant paradigm within sample papers (27.3%), see among others the study on hinterland chain coordination (i.e., De Langen and Douma, 2010). Other relevant research streams for the objective of the present study are innovation theories (18.2%), e.g., business model innovation theory (2 papers), and managerial theories which propose an alternative strategic management lens for investigating the phenomenon, i.e., knowledge based-view, resource based-view, etc. To conclude, 11 papers (25.0%) do not refer to a specific stream of theory.

Table 4.3. Theoretical perspectives in the sample papers.

Theoretical perspectives groups	***No. of papers***	***% On the sample***
SCM perspective	*12*	*27,3%*
SCM perspective	8	*18,2%*
Information Systems (IS)	3	*6,8%*
Hinterland chain coordination	1	*2,3%*
Innovation theories	*8*	*18,2%*
Innovation theory	4	*9,1%*
Business Model Innovation Theory	2	*4,5%*
Technology Adoption Model (TAM)	2	*4,5%*
Computer science theories	*3*	*6,8%*
Computer science theory	1	*2,3%*
System Dinamics	1	*2,3%*
Information technology (IT) & business process re-engineering (BPR)	1	*2,3%*
Contingency theory	*3*	*6,8%*
KBV and RBV	*3*	*6,8%*
RBV	2	*4,5%*
KBV	1	*2,3%*
Other theories	*4*	*9,1%*
Simulation & optimization approaches	1	*2,3%*
Trust theory	1	*2,3%*
Game theory	1	*2,3%*
Inductive theory building approach	1	*2,3%*
NA	*11*	*25,0%*
Overall sample	*44*	*100,0%*

Source: Authors' elaboration

The SLR provides interesting insights concerning the type of logistics centres debated in the selected papers (Table 4.4). Nearly half of the sample papers investigate the use of emerging digital technologies in storage and warehousing centres (45.5%), especially in distribution centres (22.7%). The special interest for these facilities comes from the greater complexity in the management of logistics flows, given the presence of thousands of parcels with multiple O/D (origin/destination) combinations. Moreover, the abundance of papers grounding on SCM perspective and the use of LDs and related technologies in warehouses feed the research in this field. As regards logistics centres focus on cargo transloading and rapid transit (31.8%), they are essentially represented by port terminals (27.3%), stressing their relevance for the competitiveness of the whole maritime chain. This figure is not surprising since the relevance of ICT and electronic logistics management systems for supporting port terminals' activities as well

as administrative and custom clearance procedures (Mondragon et al., 2012; Lee, Tongzon and Kim, 2016).

Table 4.4. Logistics centre's types & subtypes.

Logistic centres' type/subtypes	*No. of papers*	*% On the sample*
Storage & warehousing	*20*	*45,5%*
Distribution centre	10	*22,7%*
Warehouse	9	*20,5%*
All	1	*2,3%*
Cargo transloading & Rapid transit	*14*	*31,8%*
Port terminal	12	*27,3%*
All	2	*4,5%*
VAS & soft/light manufacturing	*2*	*4,5%*
Logistic platform	1	*2,3%*
All	1	*2,3%*
Other	*8*	*18,2%*
Overall sample	*44*	*100,0%*

Source: Authors' elaboration

Rather unexpectedly, the outcomes underline a lack of papers examining logistics centres focused on value-added services (VAS) and soft/light manufacturing (only 2 papers). Given the complex nature of this typology of logistics centres and the role play by the related managing entities as business orchestrators of the whole MSC (Notteboom et al., 2017), this gap is quite surprising. These logistics entities represent the most relevant field for investigating prominent trajectories of technological innovations in logistics, considering the number of business actors involved in various stages of the MSC and the positive effects new digital technologies is expected to generate for innovating their business model. Relatedly, new digital technologies, not only contribute to making the logistic platforms more efficient but also have a positive impact on service differentiation.

In line with RO1, the study examines to what extent selected emerging digital technologies are debated in the sample papers. Figure 4.5 reports a longitudinal analysis related to the number of mentions the selected digital technologies have received in the sample papers. The year of mention refers to the year of publication of the 44 papers. Accordingly, each digital technology can receive 44 mentions maximum (see, the last column), whereas the total mentions of every

single year (see, the last row) vary depending on the number of published papers in that year (see, Figure 4.4).

Figure 4.5. The number of mentions of digital technologies in literature: a longitudinal analysis.

		Year of mention												
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Overall
Digital technologies	Location detection technologies	1	1	2	3	0	5	1	2	3	2	8	3	31
	Big data analytics & advanced algorithms	0	1	0	1	1	3	0	3	3	2	6	5	25
	Smart sensors	1	1	1	2	0	5	0	1	2	2	8	2	25
	Cloud computing	0	1	1	0	0	1	0	4	2	1	7	4	21
	IoT platforms	0	1	1	0	0	2	0	2	2	1	8	1	18
	Mobile devices	0	0	1	1	0	3	0	2	1	0	6	2	16
	Automated system and robotisation	1	1	1	2	1	3	0	1	1	1	4	0	16
	Advanced human-machine interfaces	0	1	0	0	0	1	0	2	2	2	5	0	13
	Multilevel customer interaction & customer profiling	0	0	1	1	1	1	1	1	1	0	3	0	10
	Authentication & Fraud detection	0	0	0	1	0	0	1	1	1	0	3	1	8
	Blockchain technologies	0	0	0	0	0	0	0	0	0	1	0	0	1
	Augmented reality/wearables	0	0	0	0	0	0	0	0	0	0	1	0	1
	3D printing	0	0	0	0	0	0	0	0	0	0	0	0	0
	Overall	3	7	8	11	2	24	3	18	18	12	59	18	

Source: Authors' elaboration

What emerges from the analysis is 70.5% of the papers deals with LDs, whereas BDA, SSs, and CC are addressed by more than half of the sample papers. These figures prove the relevance of

the abovementioned innovations for the growth and transformation of the MSC. Conversely, BT, AR and 3DP are rather neglected and do not appear enough mature for the business.

4.4.2. Business benefits of digital technologies

Consistent with RO2, sample papers are further examined to identify major business benefits for logistics centres of the MSC, originating from the adoption and diffusion of digital technologies. The study stresses potential managerial and marketing opportunities that enable these logistics centres to innovate their business model and improve the competitiveness of the whole MSC. For this purpose, we create three ad-hoc categories to bundle the heterogeneous business benefits detected in the second stage of the SLR, namely "efficiency", "service differentiation & SRM", and "strategic management". Table 4.5 reports the results of this analysis.

Table 4.5. Business benefits for logistics centres within the maritime supply chain.

Category	***Main digital technologies***	***% On sample***	***Business benefits***	***% On category***
Efficiency	Location detection technologies, smart sensors, cloud computing, IoT, automated systems and HMI	64%	Operational efficiency	61%
			Costs reduction	39%
Service differentiation & SRM	Big data analytics, smart sensors, IoT, mobile devices and HMI	45%	Networking & information sharing	60%
			Personalisation & CRM	30%
			Disintermediation	10%
Strategic management	Location detection technologies, big data analytics, IoT and cloud computing	34%	Support of strategic decision	53%
			Flexibility & scalability	27%
			Sustainability & smart distribution system	20%

Source: Authors' elaboration

The category "efficiency" grounds on two main benefits, respectively operational efficiency (61% of sample papers marked with the "efficiency" category) and costs reduction (39%). Notably, 28 sample papers (64%) debate logistics centres' efficiency gains, showing the high interest of academics in investigating to what extent digital technologies can improve the efficiency of

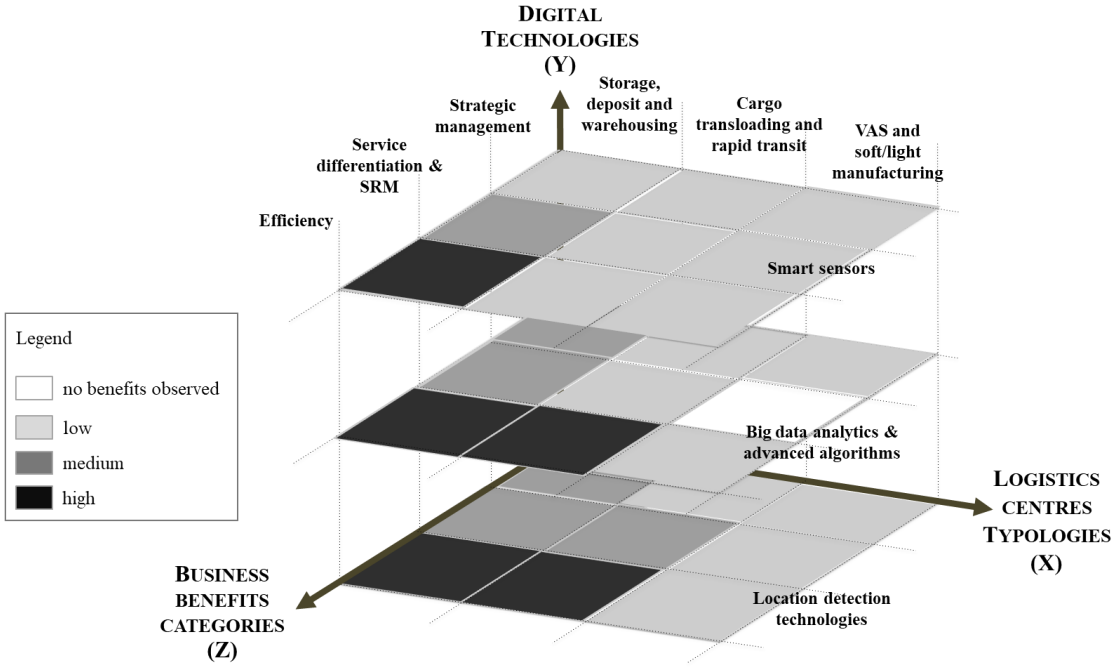
logistics operations. In this perspective, advanced HMI, big data analytics and IoT systems can support logistics firms in optimizing physical resources allocation and asset utilization (Mondragon et al., 2012; Haddud et al., 2017). Venkatesan, Maragatham and Lavanya (2016) assert the adoption of IoT platforms in logistics centres improve the level of efficiency in cargo handling operations as well as safety and security. De Langen and Douma (2010) claim to track and trace devices support logistics centres in reducing gate congestion and other bottlenecks throughout the MSC since they are constantly informed about the localisation of cargo. Radio-frequency identification (RFID) represents also one of the most debated and diffused technology in maritime logistics due to its low expense compared to the significant reduction of logistics costs it can generate, especially those related to warehouse inventory (Cheng et al., 2017). In addition, the diffusion of cloud computing and integrated information systems across the MSC enables to reduce inventory costs, thanks to more accurate demand forecasting (Bruque Camara, Moyano Fuentes and Maqueira Marin, 2015). Regarding cost reduction benefits, the implementation of an automated system (e.g., Automated Storage/Retrieval System) by warehouses and distribution centres, may substantially reduce the overall labour costs (Hu and Chang, 2010). Moreover, automation has proven to drastically reduce the costs of container terminals, especially for the decrease in the number of required dockworkers and the enhancement of the overall operational efficiency (Notteboom and Vitellaro, 2019).

The "service differentiation and SRM" category ranks second (45% of the sample papers). The most debated benefit in this category is networking and information sharing systems (60%). Academics and practitioners agree that collaboration with key trading partners or customers requires a strong relationship of trust based on information sharing (Huong Tran, Childerhouse and Deakins, 2016). Bellingkrodt and Wallenburg (2013) argue digital technologies are expected to create wider and more embedded networks of players belonging to the MSC. In this vein, LDs and digital networks (e.g., IoT) may improve shipping, receiving and put-away processes, thanks to a higher level of information sharing and synchronization among MSC actors (Wamba et al., 2008). In this perspective, emerging digital technologies are introducing a new way to overcome the "vertical silos" approach of traditional ICT systems adopted by logistics centres, encouraging collaboration with other stakeholders aiming at promoting an innovative value proposition (Kubler et al., 2017). LDs and IoT, indeed, allow customers to control the status of the freight, improving their satisfaction with the service provided (Cheng et al., 2017). These benefits are crucial for MSCs since the digital exchange of information can accelerate transport and logistics activities. When it comes to personalisation and customer relationship management (CRM) benefits (30%), digital technologies contribute to enhance business-to-business relationships in downstream markets, overcoming vendor management inventory (VMI) approaches (Cariou,

2018). In this perspective, Choi end Sethi (2010) propose an innovative supply chain system aiming at improving the VMI of logistics centres as well as at developing a more collaborative relationship with the customers. Moreover, port terminals that undertake the e-transformation and adopt innovative ICT systems to communicate with the stakeholders (Lee, Tongzon and Kim, 2016), may gain the loyalty and trust of their direct clients (e.g., shipping lines, shippers and freight forwarders). This leads to a higher level of customer satisfaction, by lifting the competitiveness on the MSC. Finally, disintermediation benefits (10%) consist of direct communication among MSC actors via IT systems, removing intermediaries between logistics centres and their stakeholders and, thus, increasing B2B relationships (Abdel-Basset, Manogaran, and Mohamed, 2018).

Papers categorised as "strategic management" (34% of the sample) focus on the use of emerging digital technologies to support the strategic decisions (53% of the papers in this category), to make the business model and related activities more flexible and scalable (27%), and, finally, to create a sustainable and smart distribution system (20%). Haddud et al. (2017) suggest new digital technologies may support the strategic planning process of logistics centres for some of their core business activities (e.g., marketing and sales, warehousing and logistics handling and operations). They ensure information accessibility and data sharing with selected stakeholders of the MSC, facilitating the process of data gathering and decision-making (Wamba et al., 2008). In particular, Vásquez Rojas et al. (2018) highlight the importance of text mining and data analysis to transform textual information of various sources into strategic data. Over the last years, the amount of information logistics centres is called to manage have been significantly increasing, especially in the MSC (Heilig and Voß, 2017). Therefore, digital tools are pivotal to explore data and support strategic and operational decision-making, especially for unexpected changing market conditions (Marchet, Perego and Perotti, 2009). When it comes to flexibility and scalability benefits (27%), cloud computing and IoT platforms ensure a certain level of operational flexibility, which constitutes a valuable competitive advantage for logistics centres since they operate in a business characterized by high levels of uncertainty (De Langen and Douma, 2010). In this perspective, digital technologies allow the management of a large volume of data which increase the scalability and adaptability of the services provided by logistics centres (Arunachalam, Kumar and Kawalek, 2018). Other sample papers investigate innovative solutions for distribution network models. For example, Castillo et al. (2018) introduce a smart distribution system based on "crowdsourced delivery agents" for last-mile deliveries. This kind of option exploits digital technologies to stimulate B2B relationships as well as social interactions across the MSC by making use of digital technologies and platforms.

Figure 4.6. An application of the multi-layered conceptual framework.



Source: Authors' elaboration

Finally, we draw the three categories of business benefits (i.e., Efficiency, Service differentiation & SRM and Strategic management) on the Z-axis of our proposed multi-layered conceptual framework (see, Figure 4.3). In line with RO2, we use this framework to assess the business opportunities for each typology of logistics centres within MSCs that result from the adoption of investigated digital technologies. Figure 4.6 reports an empirical application of the conceptual framework for the three most debated digital technologies (i.e., LDs, BDA, and SSs). The colour intensity of each combination denotes the potential positive effects of digital technologies on logistics centres' business model according to scholars' contributions. In this regard, location and detection technologies as well as big data analytics and advanced algorithms are expected to have a huge impact on the level of operational efficiency in both logistics centres focus on storage, deposit and warehousing and cargo transloading and rapid transit. Moreover, they may significantly support these typologies of logistics centres in the strategic decision-making processes and stakeholder relationship management. On the other hand, smart sensors unveil a general low contribution to the business model of logistics companies, excluding deposits and warehouses. Surprisingly, according to the extant literature, all three technologies are expected to not affect logistics centres focus on VAS and soft/light manufacturing, especially big data analytics and advanced algorithms that should have the potentialities to foster this kind of activities instead.

4.5. Conclusions

The paper provides valuable outcomes for both academics and practitioners. Adapting Abell's theoretical model to the investigated empirical domain, the study adds to the extant literature by shedding light on the main business benefits which originate from the adoption of new digital technologies of Industry 4.0 by each typology of logistics centres of MSCs.

The results of the SLR demonstrate the lack of an overarching analytical framework capable to identify and classify business benefits and opportunities of digital innovation in MSCs. Prior studies focus mainly on the relevance of operational efficiency issues and thus a more comprehensive theoretical framework is required to include strategic and managerial dimensions. Therefore, the paper suggests the first taxonomy of business benefits that cargo logistics centres in MSCs can leverage, stressing managerial and marketing opportunities. In particular, "efficiency", "service differentiation & SRM", and support of "strategic management process" are identified as the main categories of business benefits.

The proposed multi-layered conceptual framework, which combines logistics centres, digital technologies and business benefits, identifies potential managerial and marketing opportunities for each typology of logistics centre after the adoption of the investigated technologies. The results underline digital technologies are definitively expected to improve the operational efficiency of logistics centres acting as deposits and warehouses (e.g., LDs may significantly reduce gate congestion and other bottlenecks throughout the MSC). Moreover, they can support the strategic decision-making process and the management of relationships with stakeholders. Digital technologies, indeed, provide logistics centres with the opportunity to widen their networks and to improve the collaboration with MSC actors.

Despite the paper deals with a critical issue for the competitiveness of logistics centres, it still suffers some inherent limitations. First, the literature review provides valuable insights on the most established digital technologies in the maritime logistics domain, suggesting viable opportunities for logistics centres' managers to innovate their business. However, only a handful of emerging digital technologies are deeply scrutinized by scholars, including among others, LDs, BDA and SSs. A large group of innovations (e.g., IoT, BT, MDs and HMI) appears still underexplored or neglected, offering promising future research fields.

Second, the paper explores managerial and marketing opportunities for cargo logistics centres in MSCs. This leaves room for further studies on other typologies of logistics infrastructures (e.g., airports, rail stations, etc) and specific traffic flows. Next research, indeed, may scrutinize logistics centres called to manage predominantly passenger flows. In this empirical context,

different digital technologies (e.g., augmented reality) may provide unprecedented or unexpected business opportunities related to people services.

Finally, most investigated technologies, especially BT, require close collaboration among MSC actors to support their development (Bavassano, Ferrari and Tei, 2020). The highly competitive environment of MSCs, which result in weak ties among the players and the poor attitude to cooperate, may restrain the interactive learning process as well as slow down the adoption and diffusion of digital technologies across logistics networks. Therefore, further studies are expected to investigate these barriers and find solutions to accelerate the adoption of digital innovations in maritime logistics. Moreover, they may stretch out the number of business benefits for logistics centres to strengthen the proposed conceptual framework and the scrutiny of managerial and marketing opportunities.

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CHAPTER 5

SOCIAL MEDIA AND CSR IN PORTS: THE CASE OF TWITTER AT THE PORT OF ROTTERDAM

5. Social media and CSR in ports: the case of Twitter at the port of Rotterdam

Vitellaro, F., Satta, G., Parola and F. and Buratti (2021). Social media and CSR in ports: the case of Twitter at the port of Rotterdam, *2021 World of Shipping Portugal Conference*[6]

Abstract

The unprecedented pressure of public opinion on corporate social responsibility (CSR) issues is asking port managing bodies (PMBs) for a profound strategic and organisational rethinking, including radical changes in communication strategies. The advent of social media has provided PMBs with unprecedented opportunities to redesign CSR communication strategies. Since no prior academic studies have investigated this specific topic, the research objective of the paper is twofold. First, it scrutinises the current state of the art concerning the adoption of the most popular social media by European PMBs. Second, it investigates the use of social media in the CSR communication strategies of European PMBs. The paper carries out online field research on the use of social media by the top-25 European ports. Then, it provides an in-depth case study of the use of Twitter by the Port of Rotterdam for CSR communication purposes. In this regard, a content analysis of the tweets published in the 2017-2019 timeframe is performed. Empirical findings demonstrate the extensive use of social media by European PMBs. Uneven approaches emerge considering port sizes and cultural clusters. The paper provides also managerial insights and future promising research avenues related to social media for communicating CSR in the port domain.

Keywords: Port Managing Bodies (PMBs); CSR communication; social media; Twitter; Content analysis.

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5.1. Introduction

Stakeholder relationship management (SRM) practices are growing within the maritime-port industry (Verhoeven, 2010; Van Den Bosch et al., 2011; Dooms et al., 2013) along with a stronger sustainability consciousness of port managing bodies (PMBs) (Acciaro, 2015). The unprecedented pressure of public opinion on corporate social responsibility (CSR) issues is asking PMBs for a profound strategic and organisational rethinking, including radical changes in communication strategies and policies (Parola et al., 2013). Indeed, civil society and several stakeholder groups are increasingly aware of social and environmental urgencies related to the maritime-port industry (Ashrafi et al., 2020,) and both institutions and various groups of stakeholders, (especially local communities and societal groups of interests), are exercising a greater pressure on port management (Stein and Acciaro, 2020). Stakeholders are more demanding and eager for information concerning the CSR commitment and green initiatives to eliminate or limit the negative externalities of ports (Notteboom et al., 2015).

According to prominent studies of communication management (Lewis, 2003; Dawkins, 2004; Morsing, and Schultz, 2006; Sen et al., 2006; Podnar, 2008), CSR communication is becoming a pivotal strategic function of SRM, as it can exert a great influence on the behaviour and judgments of stakeholders and public opinion concerning the conduct of the business. Moreover, both scholars and practitioners agree that a well-planned, transparent, and open communication can counter the scepticism that stakeholders nurture towards the CSR commitment of modern organisations due to the lack of both external and internal consistency of the disclosed or undisclosed initiatives related to port green issues and CSR (Sen et al., 2006). Indeed, most organisations are strongly committed to ethical and social issues, but they fail to give visibility and credibility to their efforts (Lewis, 2003). In this perspective, CSR communication represents the missing link in the practice of CSR and thus the trigger to bring the SRM to an upper level (Dawkins, 2004).

Over the recent years, the advent of Web 2.0 and related platforms and applications have been shaping CSR communication strategies (Moreno and Capriotti, 2009; Fieseler et al., 2010; Michaelidou et al., 2011). In this vein, PMBs have been also increasingly disclosing additional information through online communication channels (e.g., social media), although many ports still unveil conservative approaches towards disclosure (Santos et al., 2016). Indeed, PMBs can exploit new online and digital tools to manage and balance both interests and expectations of various stakeholders, especially when searching for consensus and "license to operate" (Wang et al., 2004). Amongst others, European PMBs appear particularly sensitive to CSR issues due to institutional, social and competitive drivers (Kolk and van der Veen, 2002; Commission of the

European Communities, 2007; Parola et al., 2013) as well as due to several cultural-related dimensions and market trends. The increasing environmental awareness and concern among European institutions and citizens are demonstrated by the recent adoption of the European Green Deal which aims to improve the well-being of people by making Europe climate-neutral in 2050. The environmental consciousness is growing fast in Europe with relevant consequences on the behaviour of organisations. In this perspective, the appealing of CSR topics for both public and private port stakeholders is paving the way for the adoption of innovative communication strategies and tools, to strengthen the green and social image of the port as well as the brand awareness of the port from a port user' perspective (Parola et al., 2013; Notteboom et al., 2015).

Empirical studies (Waters and Jamal, 2011; Etter, 2014; Cortado and Chalmeta, 2016) argue that the adoption of social media as a new way to communicate CSR can support organisations with meeting the growing expectations of stakeholders. Although the increasing interest of European PMBs in communicating their ethical, social, and environmental commitment for SRM purposes, no study has already investigated the use of social media in the CSR communication strategies of ports. Therefore, the present manuscript set two research objectives: first it scrutinises the current state of the art related to the adoption of social media by European PMBs (RO1), and second, it investigates the use of social media in CSR communication strategy of European PMBs (RO2).

To address the pioneering and ambitious RO2, the paper provides an in-depth case study analysis on the use of Twitter by the Port of Rotterdam. It develops an original framework to detect and code CSR-related contents and then it performs a content analysis of the tweets published by the English account of the Port of Rotterdam in the 2017-2019 timeframe. The paper also discusses the main insights for port managing bodies and provides a tentative research agenda for setting future academic studies on this emerging topic.

5.2. CSR communication strategies on social media

5.2.1. CSR communication strategies

Since the 1980s several scholars have tried to clarify and make explicit the principles underlying effective CSR communication (Grunig and Hunt, 1984; Dawkins, 2004; Morsing, 2006). Generally, CSR communication is used by the company to raise the profile of corporate social and environmental commitment as well as to deeply influence the willingness of managers and employees (Morsing, 2006). It does not deal only with communicating, but rather with conversing with (internal and external) stakeholders. Podnar (2008) defines CSR communication as a "process of anticipating stakeholders' expectations, articulation of CSR policy and managing of different organisation communication tools designed to provide true and transparent information

about a company's or a brand's integration of its business operations, social and environmental concerns, and interactions with stakeholders". Therefore, CSR communication aims to disclose corporate economic, social and environmental commitment. It puts the spotlight on the purpose of the organisation to create a two-way transparent dialogue with its stakeholders, exploiting the whole arsenal of marketing and corporate communication tools (e.g., sponsorships, public relations, cross-media advertises, sustainability reports, etc.) (Grunig and Hunt, 1984). In this perspective, the company may use CSR communication to strengthen corporate reputation (Carroll, 1999; Morsing and Schultz, 2006), to differentiate the products/services provided (Dawkins, 2004) and to improve the relationships with internal and external stakeholders (Lewis, 2003).

One of the advantages of CSR communication is the possibility of reaching a potentially wide audience, consisting of policymakers and institutions, media, investors, non-governmental organisations (NGOs), local communities, consumers and employees (Dawkins, 2004). While the numerous and heterogeneous recipients prove to be eager to obtain as much information as possible about the social and environmental commitment of the company, they tend to easily yield to scepticism, especially when these activities are over-hyped (Du et al., 2010). Therefore, CSR communication must generate consensus and participation by addressing the values sought by stakeholders and limiting or eliminating the risk to be perceived exclusively as a self-congratulation practice (Sen et al., 2006). According to Carroll (1999) when the company correctly and transparently communicates its efforts to make the business more sustainable, it can strengthen the loyalty and the goodwill of stakeholders, especially when they feel involved in the initiatives and thus in the decision-making process. For this reason, CSR communication cannot ignore some critical factors, including the actual CSR commitment of the company as well as the magnitude and the impact of related initiatives on society and the environment. Moreover, transparency represents one of the most challenging and controversial factors because the content of messages is typically difficult to verify and evaluate by the recipients (Carroll, 1999). In this perspective, the choice of the right communication channel for each specific message and target is crucial for the effectiveness of CSR communication and related strategy (Du et al., 2010).

5.2.2. Communicating CSR on social media

Notably, CSR communication makes extensive use of various channels to disseminate corporate messages concerning corporate sustainability performance and commitment (Hooghiemstra, 2000). Several organisations ground on institutional channels (e.g., annual sustainability report, press releases, corporate website), traditional media (e.g., radio and television, advertisements in

the daily and periodical press, etc.), and "new media" (e.g., social media, blogs, etc.) to disclose their ethical, social, and environmental initiatives (Coupland, 2005).

Over the last years, an increasing number of companies have adopted new digital communication channels for supporting their communication strategies (Michaelidou et al., 2011). The advent of Web 2.0 and related platforms, including social media, has changed the dialogue and the exchange of information between organisations and their stakeholders, raising the number of CSR contents because of the increasing attention of people to sustainable issues (Fieseler et al., 2010). According to Kate et al. (2009), social media are Web 2.0-based applications that promote the creation and exchange of User Generated Content. They are capable of aggregating individuals and groups with pre-existing social ties (e.g., work or family relationships) or common interests to explore topics and freely share opinions, experiences and perspectives using texts, images, and videos (Cortado and Chalmeta, 2016). For this reason, social media is expected to cover a prominent role in CSR communication strategies, since it can reach a wide audience, at lower costs and in a faster time than traditional communication channels (Dawkins, 2004). Given the inherent lack of truthfulness and verifiability of CSR communication (Carroll, 1999), social media may also contribute to raising the credibility of CSR communication contents.

Moreno and Capriotti (2009) argue social media have a wide-ranging potential because of their transparency and neutrality, which are particularly appreciated by public opinion. Indeed, organisations can involve reliable and well-known interlocutors (e.g., government institutions, NGOs, etc.) or refer to institutional sources (e.g., specialised websites, data, and statistics, reports of prominent consulting firms and organisations, etc.) when they publish CSR messages on their social media. These digital platforms have favoured the diffusion of new forms of CSR communication strategies based on the sharing of effective media contents and the creation of a collaborative attitude of users and followers (Waters and Jamal, 2011). Indeed, users can directly contribute to the debate on CSR topics, by commenting or creating and sharing new related contents. This has promoted the interaction between organisations and their stakeholders as well as the birth of communities capable of positively orienting public opinion (Kane et al., 2009). Therefore, social media constitutes an effective way to listen and collect stakeholders' opinions and requirements concerning CSR issues.

The dialogue with stakeholders is pivotal for the effectiveness and credibility of corporate CSR communication strategy (Fortin et al., 2001). In their outstanding work based on the model of public relations provided by Grunig and Hunt's (1984), Morsing and Schultz (2006) describe three types of CSR communication strategies to engage stakeholders. The first one is the "stakeholder information strategy", which is a one-way communication model aiming at

disseminating information about corporate CSR initiatives. This model is characterised by a low level of interactivity and thus it hardly affects the perception of stakeholders on corporate image. Conversely, the "stakeholder response strategy" and the "stakeholder involvement strategy" are based on a two-way communication model which consists of a continuous dialogue between the organisation and its stakeholders who can freely express their opinion. While in the "stakeholder response strategy" (i.e., asymmetric two-way communication) the organisation keeps control of the dialogue and leads the debate on specific topics, the "stakeholder involvement strategy" is a "balanced dialogue" (i.e., symmetric two-way communication). In this case, persuasion may occur from both parties, stimulating collaboration, strengthening the relationships, and generating beneficial outcomes for both the organisation and its stakeholders (Morsing and Schultz, 2006).

According to Etter (2014), the advent of Web 2.0 and social media has facilitated the development of symmetric communication strategies aimed at involving an unlimited number of individuals and companies. As demonstrated by several authors (Wright, 2001; Etter, 2014; Fieseler et al., 2010) the social and interactive features of these platforms have the potential to significantly improve corporate two-way communication strategies that are pivotal for sustaining such relationships when both organisations and public have access to online contents. In comparison to static websites and other online communication tools, social media have almost no gate-keeping mechanism, enabling conversation without formal hierarchies (Fieseler et al., 2010). These characteristics make social media particularly suitable for CSR communication strategies because they support organisations in meeting stakeholders' expectations (Etter, 2014). Social media constitute a direct and informal communication channel and thus it appears more transparent than traditional ones in the eyes of the public (Moreno and Capriotti, 2009). Moreover, it is expected to solve the criticality related to the verifiability of CSR contents, thanks to open and direct dialogue with stakeholders.

5.2.3. CSR and social media: opportunities for Port Managing Bodies (PMB)

Several studies have demonstrated social media has not been widely used by organisations to develop symmetric communication yet, especially for CSR communication purposes (Moreno and Capriotti, 2009). This is particularly evident in conservative industries, such as the maritime port, which are reluctant to innovate communication strategies (Buratti et al., 2018). In this general context, however, recent empirical analyses addressing the port domain argue that some pioneering PMBs are more inclined to use Web 2.0-related tools for disclosing their CSR commitment, given the benefits for SRM (Santos et al., 2016).

CSR communication practices tend to be more extensive in the port sector due to the great impact upon stakeholders (Wang et al., 2004). As hybrid organizations, PMBs are challenged to deal with the interests and expectations of both public and private stakeholders. In this perspective, they are more visible and exposed to social judgement especially concerning economic, social, and environmental issues related to the culture of the country where the port is located (Acciaro, 2015). Nowadays, legitimation from stakeholders is crucial for PMBs and thus CSR communication tools emerge as valuable opportunities to engage salient stakeholders and meet their specific requirements. As demonstrated by Parola et al. (2013) and Notteboom et al. (2015), CSR contents have a high potential to improve the port's image and brand, since stakeholders appear particularly interested in these topics. In other words, CSR communication is pivotal for consensus and "license to operate" (Wang et al., 2004) which provides PMBs with a set of essential "contributions" from stakeholders (e.g., resources, financial support, involvement, etc.). For this reason, CSR is not only entered in the mission statements of ports, but it is also one of the main objectives of their communication strategies (Santos et al., 2016).

Although the extant port management literature has investigated CSR communication in ports since the early 2000s, an interesting gap emerges in both theory and practice regarding the adoption of social media marketing tools by PMBs and related implications and benefits for CSR communication strategies. Since empirical research in port management is still lacking, the research objective of the paper is twofold:

- **RO1**: to scrutinise the current state of the art related to the adoption of social media by European PMBs.
- **RO2**: to investigate the use of social media in the CSR communication strategy of European PMBs.

5.3. Data and method

5.3.1. Empirical background

For the aims of the paper (RO1, RO2), the European ports emerge as an ideal empirical field of investigation. Extant port management literature on CSR communication, in fact, significantly grounds on case study analyses from European ports, as they appear particularly sensitive to CSR issues in line with the institutional, social, and competitive drivers characterising the aforementioned geographical area. In this perspective, the European Commission asks PMBs for establishing a social dialogue with local communities and public authorities to harmonise the emerging interests and strategic objectives (Commission of the European Communities, 2007). Besides, the increasing pressure from EU public opinion on sustainable development has also

involved the port-maritime industry, requiring PMBs and the actors of maritime clusters (e.g., shipping companies, terminal operators, etc.) to adopt more sustainable practices and transparent disclosure (Kolk and van der Veen, 2002; Buratti et al., 2018).

Besides, Darbra et al. (2004) stress the growing interest of European PMBs in CSR reporting and in the research of alternative effective ways to communicate their commitment to sustainability issues. Therefore, European PMBs are expected to keep the pace of other industries and exploit the features of social media to boost their CSR communication strategies. Then, RO1 aims to shed light on the adoption of these tools by European PMBs to lay the foundations for the in-depth analysis of CSR communication purposes.

When it comes to RO2, given the exploratory nature of the research objectives, the research design grounds on an in-depth case study analysis on the use of a widely diffused social media platform (i.e., Twitter) by the Port of Rotterdam which represents the most prominent PMB in Europe and unveils a proactive and smart approach toward both CSR strategies, as well as the adoption of innovative social media communication strategies. The Port of Rotterdam is the leading European port in terms of cargo throughput (Drewry 2019; Eurostat 2020). It is also widely considered an innovative and pioneering port for the managerial approach towards the market and the introduction of SRM practices, including CSR communication strategies (Van Den Bosch et al., 2011; Notteboom et al., 2015). The Port covers a pivotal role in the economic growth of the city of Rotterdam and the whole Dutch territory. A recent study of the Erasmus University Rotterdam estimated that the port generated €45.6 billion in 2018, which is 6.2% of the added value of the Netherlands. Around 180,000 people work every day for the port, which represents approximately 19% of the total workforce of the Rijnmond region. This has led the PMB to make significant moves towards sustainable development and the adoption of SRM practices to meet the expectations of the numerous stakeholders. In this perspective, the PMB has been working to strengthen the CSR commitment of the port, as evidenced by its efforts for countering climate change and for ensuring the strong commitment of port community actors to Dutch prosperity and employment. Thus, it is involving stakeholders to collaborate on green and social initiatives to build a new concept of a more sustainable and smarter port. Indeed, one of the main goals included in the port strategy is the energy transition that aims to reduce the carbon footprint of the port as well as the harmful emissions generated by the ships.

Concerning the choice of focusing on Twitter, it relies on two main reasons: first, the wide diffusion of Twitter in Europe among both institutions (Golbeck et al., 2010) and private entities (Arvidsson et al., 2012) which depicts this platform as a valuable tool for two-way communication strategies and for addressing CSR topics (Cortado and Chalmeta, 2016); and second, the standard

structure of tweets that makes the content analysis easier to perform and the results more reliable to compare (Etter, 2014). Twitter is a micro-blog launched in 2006 with the main goal to disseminate information rapidly. It is not about mainly socialising or sharing contents with friends, but, conversely, sending a direct message of 280 words to be read by as many people as possible in the shortest possible time creating a fruitful exchange of ideas. It also represents one of the most popular Web 2.0 social media with over 330 million monthly active users and approximately 500 million new tweets every day (Twitter, 2019). Although Twitter cannot be considered a perfect democratic mirror of society (Hargittai and Litt, 2011), previous studies have demonstrated that it is widely used by politicians and national/local governments (Golbeck et al., 2010), journalists, investors (Arvidsson et al., 2012), NGOs (Segerberg and Bennett, 2011), activists (Christensen, 2011), and consumers (Fortin et al., 2011), that are involved in CSR issues for various reasons. Cortado and Chalmeta (2016) argue Twitter is the perfect place for organisations to publish CSR-related messages and debate sustainability issues with stakeholders since most of them are registered users. Indeed, the contents address not only anonymous public but interested stakeholders (i.e., "followers"), especially local communities and societal groups of interests, which are typically active users of Twitter and CSR-enthusiastic (Etter, 2014).

According to these studies, Twitter is expected to be a valuable tool for the CSR communication strategy of European PMBs, especially for the Port of Rotterdam which is considered a leading innovator in this field. Indeed, PMBs can exploit the specific features of Twitter to reach different categories of public and private stakeholders of the maritime-port cluster, raising the green and sustainability profile of the port and thus its competitiveness.

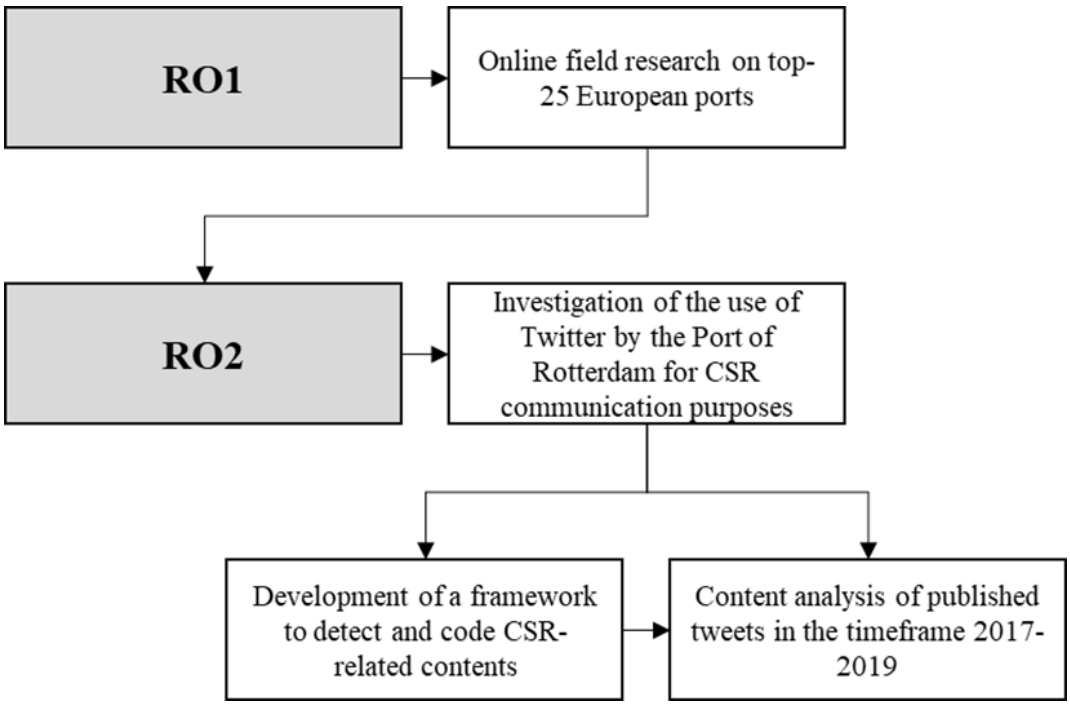
5.3.2. Research design and method

Given the exploratory nature of the study and the ambitious ROs, the complex and articulated research design is reported in Figure 5.1. Then, the methodology applied for the research is divided into two parts in line with the number of research objectives.

Consistent with RO1, the paper scrutinises the current rate of adoption of social media by European PMBs. Therefore, it investigates a sample of top-25 European ports in terms of cargo throughput in 2018 (as reported in the next section) according to the most recent available ranking provided by Eurostat (2020). In February 2020, online field research on the use of five of the most popular social media in Europe, namely Facebook, Twitter, Instagram, YouTube and LinkedIn (Statista, 2020), was performed. First, we visited the corporate webpage of the PMBs of selected ports to verify if they report the hyperlinks for directly connecting to their social media profile. Although all sample PMBs have a corporate webpage, it turns out that only some provide

information about their use of social media. Therefore, a further investigation in maritime-port press news and reports was performed. Finally, we used the search function of each social media platform to look for the profile of sample ports. Both official and institutional names as well as (possible) screen names (e.g., "Ports of Genoa" for the PMB of the port of Genoa) were used to guarantee the reliability of the empirical methodology. As a result, ad-hoc databases were developed collecting data from the social media profile of each investigated PMB which includes the following information: adoption of the specific social media; year of initial registration; the number of followers/subscribers; the number of likes to the page/profile/channel; the number of views (only for YouTube); the number of contents published, or photos/videos uploaded; and the number of employees with a registered profile (only for LinkedIn). The databases (see Appendices) identify the most used social media and provides valuable insights on the proactivity of PMBs on these platforms and some metrics for evaluating user engagement (e.g., number of followers and likes).

Figure 5.1. Research design and method.



Source: authors' elaboration

To investigate the use of social media in the CSR communication strategy of European PMBs (i.e., RO2), the paper provides an in-depth case study analysis of the use of Twitter by the Port of

Rotterdam for CSR communication purposes. We carried out a content analysis of the tweets published by the English Twitter account of the Port of Rotterdam (i.e., @PortOfRotterdam). Data gathering was performed by using the software Nvivo. The initial sample consisted of all available tweets of @PortOfRotterdam (i.e., 3,198) which represents 61% of the total amount of tweets posted by the account since 2009 (the year of initial registration). The number of available tweets that Nvivo can capture is determined by Twitter and it depends on the privacy settings of the posting user and the age of the tweet. In this perspective, to reduce uncertainty and validate the procedure of data mining, two of the authors (defined "coders") manually collected all available tweets on the browser. The procedure has led to 834 tweets from 2 September 2016 (the last date accessible) to 10 February 2020 (the date of data mining). These results were compared with the outcomes of data mining performed through Nvivo considering the same timeframe. It turned out that Nvivo captured 98% of tweets published by @PortOfRotterdam in the period under review, which confirms the high reliability of the software. As a result, the final sample is made of 760 tweets that were published in the last three years (i.e., 2017, 2018 and 2019). Then, data was organised in an ad-hoc database which includes the following information for each sample tweet: the content of the tweet, tweet type (i.e., tweet vs retweet), date and time of publication, number of retweets, hashtags, mentions, and number of replies received for each tweet.

The content of sample tweets (i.e., units of analysis) was investigated by performing a two-steps qualitative content analysis, combining the features of Nvivo and the experience of the authors and a panel of experts in CSR communication. Therefore, we developed an original framework for detecting and coding CSR-related contents based on the schema provided by CSRHub, which reports four categories and three subcategories (Table 5.1). The first step of the analysis consists of the use of Nvivo to detect all the tweets which contain specific keywords concerning the CSR domain in the maritime-port industry. Therefore, we outlined a list of terms reflecting the concepts and issues of each subcategory of the framework (e.g., "welfare", "volunteerism", "safety", "social", "employee", "grant", "energy transition", "green", "pollution", "recycle", etc.). We included multiple terms and synonyms referring to the same concept to collect all potentially suitable tweets. Then, the list of terms was validated by a panel of experts in CSR communication, belonging to both different industries and academia. In the second step, the two coders exported in Microsoft Excel the tweets detected by Nvivo to code in one category and subcategory consistent with the conceptual framework. This step is crucial because it goes beyond merely detecting and counting words. It brings to light the actual underlying meaning of the tweet, improving the quality and reliability of the analysis. As a result, the tweets which contain CSR-related terms but do not address CSR-related issues were rejected. Finally, the authors who were

not involved in coding, cross-validated the evaluation and classification of the sample tweets in the categories carried out by the coders, solving all inconsistencies until 100% agreement was reached.

Table 5.1. The framework to detect and code CSR-related contents: categories and subcategories.

Governance	Employees	Environment	Community
Board covers PMB's effectiveness in following best practices in corporate governance principles, board activities and functions, and board structure and composition. It deals with how a PMB provides competitive and proportionate management to achieve both financial and extra-financial targets.	**Compensation and Benefits** cover PMB's capacity to increase the loyalty of port workers through rewarding, fair and equal compensation procedures that involve port community actors. It also includes benefits and initiatives aimed to engage employees and improve their performance.	**Energy and Climate Change** measures PMB's effectiveness in addressing climate change by suitable policies and strategies, energy-efficient operations, and the development of renewable energy and other alternative environmental technologies. The subcategory includes green strategies addressed to reduce harmful emissions and other Greenhouse Gas Emissions (GHG) as well as the carbon footprint of the port.	**Community Development and Philanthropy** cover the relationship between PMBs and local communities. This subcategory reflects the community citizenship of the port reporting charitable giving, donations, volunteering, and social initiatives. Moreover, it includes measures for protecting public health and managing the social impacts of port operations. Land use and real estate management policy for sustainable urban development and reduction of impact on the local economy and ecosystem are also included.
Leadership Ethics measures how a PMB manages its relationships with various stakeholders, including the financial community, terminal operators, port users, carriers, shipping companies, passengers, port services providers and regulators. This subcategory measures PMB's effectiveness in treating these stakeholders equitably. It includes the PMB's culture of ethical decision making and measures its commitment to integrate social and environmental aspects into the overall core strategy. Moreover, it comprises sustainability principles concerning day-to-day port activities.	**Diversity and Labour Rights** covers workplace policies and practices addressed to guarantee the fair and non-discriminatory treatment of port workers. This subcategory comprises labour-management relations and participation by employees, violations or patterns of anti-union practice, conformance to internationally worker rights, as defined in the International Labour Organization (ILO). Fundamental labour rights consist of freedom of association; minimum age for the employment of children; a prohibition against forced labour; lack of employment and occupational discrimination; equal compensation.	**Environmental Policy and Reporting** comprises PMB's policies and intentions to reduce environmental impact and improve health for the port community and the environment, now and in the future. The subcategory also includes the PMB's environmental reporting performance, adherence to environmental reporting standards (e.g., Global Reporting Initiative), and other reports and publications referring to environmental performance. It deals with compliance with port stakeholders, regulatory and stakeholders' requests for transparency, reporting limits and accidental releases.	**Product** refers to the responsibility of the PMB for the development, design, and management of services and actions directed to customers, port community and society at large. The subcategory reflects PMB's capacity to create new market opportunities and stimulate collaborations between the community and other stakeholders. It comprises services and actions aimed at reducing environmental costs and enhancing customers' quality of life. Moreover, the subcategory reports the integrity of PMB's services as well as sales practices and marketing policy. It also relates to the safety and quality of the services and the capacity of PMB

	This subcategory measures PMB's ability to maintain diversity, provide equal opportunities regardless of gender, age, ethnicity, religion, or sexual orientation, and promote work-life balance.		to respond to problems with safety and quality.
Transparency and Reporting cover corporate policies and practices aligned with sustainability goals. It reflects the transparency in communication with stakeholders. Moreover, this subcategory includes reports according to the international standards (e.g., Global Reporting Initiative, AccountAbility and other standards) and results achieved. It also comprises the disclosure of PMB's major stakeholders, including public entities and institutions, and how it engages with them. It covers whether the PMB signs an agreement of collaboration for transparent communication.	**Training, Safety and Health** measure PMB's effectiveness in providing and promoting a healthy and safe workplace. This subcategory includes acci4ent and safety performance, as well as job training, safety standards and training, and employee-management safety teams. It includes programs to support the health, well-being and productivity of all employees. This subcategory compromises policies and programs that involve port community actors, especially terminal operators, in boosting employee morale, workplace productivity, port actors' policies and practices to engage employees, and worker development.	**Resource Management** covers how efficiently resources are used in port operations and activities. It refers to PMB's capacity to reduce the use of materials, water and to find more efficient solutions by improving maritime supply chain management. This subcategory comprises waste and recycling performance, i.e., the proportion of waste recycled of the total waste. Data includes how PMB manages and coordinates operations to benefit land use and local ecological stability. The water resource data includes consumption of drinking water, industrial water and steam.	**Human Rights and Supply Chain' partners** measure PMB's commitment to respect fundamental human rights and maintain the license to operate. It reflects its capacity to support freedom of association and exclude forced or compulsory labour in port. This subcategory covers PMB's transparency, monitoring and disclosure of issues concerning human rights.

Resource: Authors' elaboration on the schema of CSRHub

Board covers PMB's effectiveness in following best practices in corporate governance principles, board activities and functions, and board structure and composition. It deals with how a PMB provides competitive and proportionate management to achieve both financial and extra-financial targets. Compensation and Benefits cover PMB's capacity to increase the loyalty of port workers through rewarding, fair and equal compensation procedures that involve port community actors. It also includes benefits and initiatives aimed to engage employees and improve their performance. Energy and Climate Change measures PMB's effectiveness in addressing climate change by suitable policies and strategies, energy-efficient operations, and the development of renewable energy and other alternative environmental technologies. The subcategory includes green strategies addressed to reduce harmful emissions and other Greenhouse Gas Emissions (GHG) as well as the carbon footprint of the port. Community Development and Philanthropy cover the relationship between PMBs and local communities. This subcategory reflects the community citizenship of the port reporting charitable giving, donations, volunteering, and social initiatives. Moreover, it includes measures for protecting public health and managing the social impacts of port operations. Land use and real estate management policy for sustainable urban development and reduction of impact on the local economy and ecosystem are also included.

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5.4. Empirical results

5.4.1. Social media adoption by European Port Managing Bodies

The results of the online field research reveal a wide use of social media by European PMBs. Indeed, the top-25 European PMBs have, on average, an active profile on at least 3 out of 5 investigated social media (Table 5.2). Considering the average rate of adoption, Twitter ranks first (88% of sample PMBs have an active Twitter account), followed by LinkedIn (80%), Facebook and Instagram (68%), and YouTube (56%).

The port size represents an interesting criterion to explore the results (Santos et al., 2016). In this perspective, we classify the ports consistent with the annual cargo throughput (thousand tonnes) reported in 2018. Therefore, three categories are outlined: "large", throughput (t)> 100,000; "medium", 50,000 < t < 100,000; and "small", t < 50,000. The empirical results indicate that a direct correlation exists between the volume of cargo throughput and the rate of adoption. The three largest ports of the sample (i.e., Rotterdam, Antwerp, and Hamburg) report a rate equal to 100% (Table 5.3), whereas the ports labelled as "medium" to 77% and small to 58%, on average. However, there are some significant differences between medium and small ports when considering single social media. Instagram is almost neglected by small ports (40%), which demonstrate to prefer by far Facebook (70%). Conversely, medium ports report a higher rate of adoption for Instagram (83%) than for YouTube and Facebook (58%). Regardless of the port dimension, Twitter appears the most promising social media for communication purposes since it reaches rates of adoption higher than 80% for each category.

Another interesting criterion of analysis consists of the cultural cluster the ports belong to. According to the well-known contribution of Gupta et al. (2002), the cultural cluster of societies provides valuable managerial and practical insights. The criterion goes beyond geographical and political boundaries and groups ports according to the cultural similarities of their respective countries. This may contribute to compare the adoption and use of social media originating from different cultural environments. In this perspective, Santos et al. (2016) argue online communication strategies varied among ports from different countries in terms of both types of channels and contents.

Table 5.2. Empirical results: social media adoption by top- European PMBs.

Ranking	Throughput (2018)	Top-25 European ports	Port size	Cultural cluster	Rate of adoption					
					Facebook	*Twitter*	*Instagram*	*YouTube*	*LinkedIn*	*Average*
1	441.473	Rotterdam	Large	Germanic Europe	Yes	Yes	Yes	Yes	Yes	100%
2	212.010	Antwerp	Large	Germanic Europe	Yes	Yes	Yes	Yes	Yes	100%
3	117.627	Hamburg	Large	Germanic Europe	Yes	Yes	Yes	Yes	Yes	100%
4	99.503	Amsterdam	Medium	Germanic Europe	Yes	Yes	Yes	Yes	Yes	100%
5	88.645	Algeciras	Medium	Latin Europe	Yes	Yes	No	No	Yes	60%
6	75.672	Marseille	Medium	Latin Europe	Yes	No	Yes	Yes	Yes	80%
7	64.902	Le Havre	Medium	Latin Europe	Yes	Yes	Yes	No	Yes	80%
8	61.972	Valencia	Medium	Latin Europe	No	Yes	Yes	Yes	Yes	80%
9	57.380	Trieste	Medium	Latin Europe	No	Yes	Yes	Yes	Yes	60%
10	55.617	Immingham	Medium	Anglo Cultures	No	Yes	Yes	Yes	Yes	80%
11	54.560	Barcelona	Medium	Latin Europe	No	Yes	No	No	Yes	40%
12	53.196	London	Medium	Anglo Cultures	Yes	Yes	Yes	Yes	Yes	100%
13	51.570	Genoa	Medium	Latin Europe	Yes	Yes	Yes	Yes	Yes	100%
14	51.160	Bremerhaven	Medium	Germanic Europe	Yes	Yes	Yes	No	No	60%
15	50.925	Piraeus	Medium	Eastern Europe	No	Yes	Yes	No	Yes	60%
16	44.314	Bergen	Small	Nordic Europe	Yes	Yes	Yes	No	No	60%
17	44.310	Sines	Small	Latin Europe	Yes	Yes	No	Yes	Yes	80%
18	41.083	Dunkerque	Small	Latin Europe	Yes	Yes	No	Yes	Yes	80%
19	40.635	Goteborg	Small	Nordic Europe	Yes	Yes	Yes	No	Yes	80%
20	39.530	Constanta	Small	Eastern Europe	Yes	Yes	No	No	No	40%
21	34.468	Southampton	Small	Anglo Cultures	No	Yes	No	No	No	20%
22	34.392	Riga	Small	Nordic Europe	Yes	No	Yes	Yes	Yes	80%
23	30.935	Milford Haven	Small	Anglo Cultures	Yes	Yes	No	No	Yes	60%
24	28.836	Tees & Hartlepool	Small	Anglo Cultures	No	Yes	Yes	Yes	Yes	80%
25	28.296	Wilhelmshaven	Small	Germanic Europe	No	No	No	No	No	0%
		Sample rate of adoption			**68%**	**88%**	**68%**	**56%**	**80%**	**71%**

Source: Authors' elaboration.

Table 5.3 shows the Germanic Europe cluster reports the highest rate of adoption (77% of 6 cluster ports), followed by the Latin Europe cluster (73% of 9 cluster ports) and the Nordic Europe cluster (73% of 3 cluster ports). The empirical results denote similarities between Germanic and Nordic ports, which displays almost the same rate of adoption for each social media, excluding YouTube that is neglected by Nordic ports. Germanic and Nordic ports are the primary users of Facebook and Instagram, suggesting a prominent interest in the sharing of media contents which characterises these social media platforms. Conversely, PMBs belonging to Latin and Anglo clusters are oriented on a more formal and sober communication via Twitter and LinkedIn.

Table 5.3. Empirical results: social media adoption per port dimension and cultural cluster.

		No. of ports	**Rate of adoption**					
			Facebook	*Twitter*	*Instagram*	*YouTube*	*LinkedIn*	*Average*
Port size	*Large*	3	100%	100%	100%	100%	100%	100%
	Medium	12	58%	92%	83%	58%	92%	77%
	Small	10	70%	80%	40%	40%	60%	58%
Cultural cluster	*Germanic Europe*	6	83%	83%	83%	67%	67%	77%
	Latin Europe	9	67%	89%	56%	67%	100%	76%
	Nordic Europe	3	100%	67%	100%	33%	67%	73%
	Anglo Cultures	5	40%	100%	60%	60%	80%	68%
	Eastern Europe	2	50%	100%	50%	0%	50%	50%
Sample rate of adoption		*25*	*68%*	*88%*	*68%*	*56%*	*80%*	*71%*

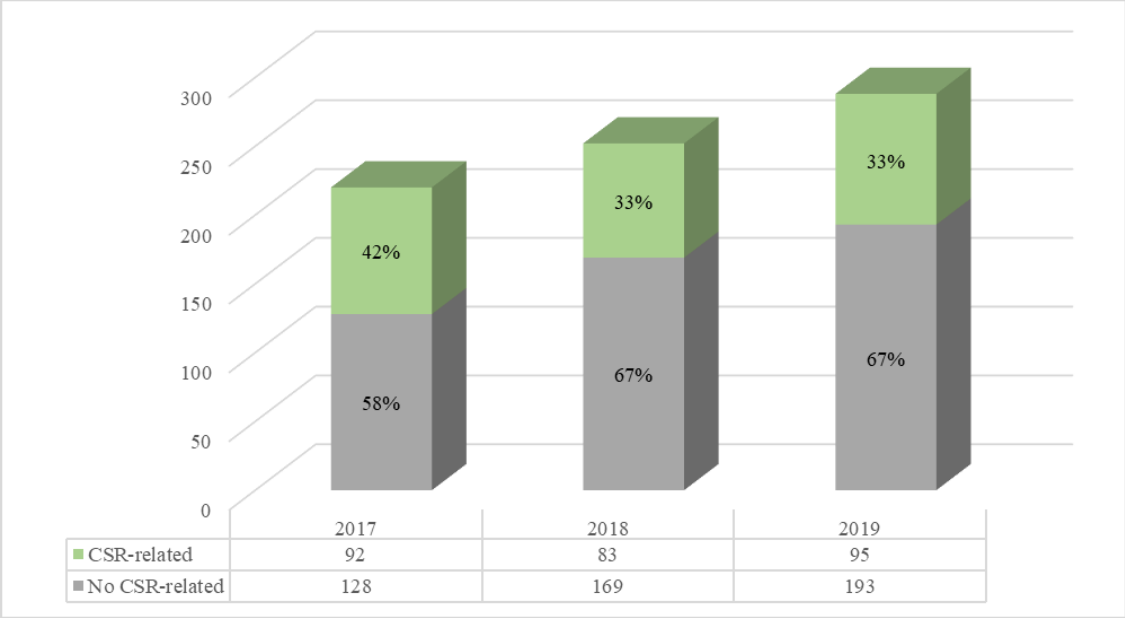
Source: authors' elaboration

When it comes to the Port of Rotterdam, it demonstrates being particularly active on each investigated social media. As reported in the Appendixes, it ranks first among the other PMBs for both the number of contents published and followers. In detail, Twitter turns out the most promising communication channel since the @PortOfRotterdam reaches the impressive value of 23.837 followers, far more than the port of Antwerp which ranks second (i.e., 15.300 followers). This wide audience increases the relevance and scope of a well-planned communication strategy. Moreover, it brings under the spotlight the strategic decision concerning the types of contents shared, including CSR-related issues.

5.4.2. The content analysis of CSR-related tweets

The content analysis investigates 760 tweets published by the account @PortOfRotterdam in the timeframe 2017-2019 (Figure 5.2). The analysis reveals 270 tweets (36% of the sample) address CSR-related issues. Although the gradual growth in the yearly number of tweets, the empirical results show a slight decrease of CSR-related tweets in percentage.

Figure 5.2. Empirical results of content analysis: CSR-related tweets.

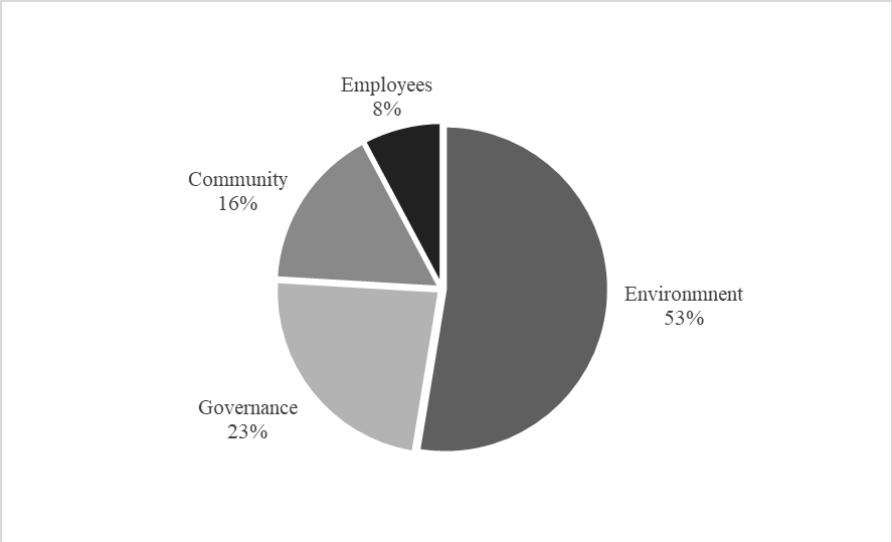


Source: Authors' elaboration

According to the applied framework (see section 3.2, the most debated CSR-related issues (Figure 5.3) belong to the category "environment" (53% of the sample), followed by "governance" (23%), "community" (16%) and "employees" (8%). The outcomes underline the strong commitment of the Port of Rotterdam to green initiatives, especially in reducing the carbon footprint of the port and the maritime port community. Moreover, most of the tweets coded in the category "environment" address the importance of energy transition and related initiatives and projects promoted by the PMB of Rotterdam. As a result, the most populated subcategory is "energy & climate change" which comprises 103 CSR-related tweets (Figure 5.4), including for instance "In the port of #Rotterdam we are working towards a CO_2-neutral port in 2050. As well as industry, the transport of freight to, in and from the port area needs to become more sustainable #energytransition #sustainability". The subcategory "resource management" (24 tweets) aims to communicate the efforts of the port in using resources sustainably. Moreover, it promotes the

circular economy and waste management using tweets like “In the port of #Rotterdam we are working towards a #circular economy in 2050. The #CO2 release and #waste from industries and consumers will be the raw material for new products. Curious how? #energytransition #sustainability”.

Figure 5.3. Main topics of CSR-related tweets.



Source: Authors’ elaboration

The empirical results of the content analysis also draw attention to the use of Twitter for disseminating the values and ethics pursued by the governance in managing the port. Indeed, the subcategory “transparency & reporting” (34 tweets) addresses the efforts for building more transparent communication with stakeholders. This subcategory consists of the tweets which provide the periodical results and objectives achieved by the port as well as the links for downloading the official reports, for instance, “2017 Annual Report: Results create a new scope for the ambitious investment programme.” As concerns the tweets coded in the sub-category “leadership ethics” (29 tweets), they describe how PMB integrates sustainability purposes in the port vision and ethics. Amongst others, some examples are “Revised port vision gives direction to Port of Rotterdam ambition. #energytransition #digitisation” and “The Port of Rotterdam has had a swarm of bees placed on the #Maasvlakte in the verge next to the Stenen Baakplein. The goal of this initiative is the conservation of the original Dutch #honeybee by reintroducing it to this region. #sustainableport”.

Quite surprisingly, the category "community" includes only 44 tweets, split between "community development & philanthropy" (24) and "product" (20). No tweets address the topics of the subcategory "human rights and supply chain partners". The subcategory "community development & philanthropy" reports the social and philanthropic initiatives promoted by the PMB for community well-being. The following tweets are some examples "The @PortofRotterdam wins 2018 ESPO #Award with its 'People in and around Ports' programme @ESPOSecretariat", "Port Authority sponsors Rotterdam Philharmonic Orchestra" and "Tomorrow is World Health Day. Check Port Health Authority for #health matters in and around the port". As concerns the tweets belonging to the subcategory "product", they disclose the services and actions to create new market opportunities for the local communities and territory. Furthermore, these contents aim to stimulate collaborations between local communities and port stakeholders. Amongst others, "Will you be the next student-entrepreneur of the Netherlands? Join #PHIA2018 by uploading your business plan" and "Are you looking for somewhere to test your offshore innovations? Discover the possibilities in the Port of Rotterdam".

Figure 5.4. Empirical results of content analysis: CSR subcategories and related tweets.

Source: Authors' elaboration

Finally, the category "employee" is populated by only 21 tweets. The subcategory "Training, health & safety" (16 tweets) emerges as the most debated topic in this domain. It concerns training courses for employees, safety procedures and implementation of new technologies for enhancing job quality and satisfaction of port workers. The subcategory includes tweets such as "Working together on a safe and flood risk proof port. Now and in the future! #sustainableport #safeport"

and “The Port of Rotterdam Authority signed a contract with @Securitas_NL for the installation of 227 cameras in the #port and #industrial area”

5.5. Discussion and conclusion

Over the last years, European PMBs have shown an increasing commitment to CSR aiming at reinforcing the relationships with stakeholders (Darbra et al., 2004; Kolk and van der Veen, 2002; Santos et al., 2016). Therefore, CSR communication has assumed a key function in port management since sustainability practices and initiatives must be communicated in the right way to achieve the expected outcomes (Du et al., 2010; Santos et al., 2016). Although the advent of web 2.0 and social media has provided organisations with valuable tools to redesign and strengthen CSR communication strategies (Moreno and Capriotti, 2009; Etter, 2014;), few prior studies have empirically investigated whether and how CSR efforts are effectively communicated to port stakeholders.

The present exploratory study brings to light European PMBs are keeping the pace of other industries, integrating social media into CSR corporate communication. This result is not completely unexpected. Indeed, PMBs are moving forward to new managerial and governance practices for running the business and managing the relationships with port stakeholders, similarly to private companies (Parola et al., 2013). In this perspective, social media have the potential to radically change the way PMBs communicate with their stakeholders. This is because social media are very inclusive and popular among the target recipients of corporate messages, like local communities, societal groups of interest and port workers who are particularly sensitive to CSR issues. Moreover, social media require relatively low financial, operating, communication and organising costs compared to the interactive possibilities they can offer (Cortado and Chalmeta, 2016). Unlike traditional forms of communication, such as corporate websites, (sustainability) reports and events, greater ease of access to dialogue and communication exists, which are pivotal to engage stakeholders and disseminate specific CSR messages. The absence of a gate-keeping mechanism also enables conversations without formal hierarchies (Fieseler et al., 2010) and it encourages interested stakeholders to interact with PMBs. In other words, social media facilitate interaction with an unlimited number of users and support PMBs with developing and sustaining relations.

The online field research on the top-25 European PMBs suggests European ports make extensive use of social media to connect with stakeholders and disseminate corporate messages, including CSR-related contents. Indeed, sample PMBs use, on average, 3 out of 5 most common social media (i.e., Facebook, Twitter, Instagram, YouTube, and LinkedIn). Nonetheless, preliminary

findings show uneven approaches of sample PMBs towards the use of social media with regards to port sizes and cultural clusters. In this vein, both endogenous characteristics and specificities of the sample ports (e.g., commercial vs touristic port, typologies of cargos handled, volumes of cargo or passengers, proximity to the city, etc.), as well as intrinsic features of the social media included in the analysis (typologies of contents, targets of messages, the scope of messages, etc.), are argued being potential drivers for different approaches to CSR communications on social media platforms. Twitter turns out to the widely used social media with an 88% rate of adoption by the sample PMBs. This confirms our assumption since Twitter can enable PMBs to disseminate messages and contests to a huge plethora of stakeholders' categories. It is also a valuable solution when open, transparent, and interactive dialogue is the goal of port communication strategy.

The content analysis of the tweets published by the Twitter account of the Port of Rotterdam in the timeframe 2017-2019 suggests more than one-third of contents address CSR issues (36% on average). Most of the CSR-related tweets advocate the strong commitment of the Port of Rotterdam to green initiatives, especially in reducing the port carbon footprint and energy transition (53% of the sample). Although the PMB of Rotterdam is particularly committed to the relationship with the local community, quite surprisingly the CSR communication on Twitter almost neglects the topics related to community outreach, such as social and philanthropic initiatives. According to previous studies (Acciaro, 2015; Dooms et al., 2013,), CSR communication towards local communities were expected to be more emphasised, given the prominent role of this category of stakeholders for the port competitiveness.

Table 5.4. Interactive CSR-related tweets.

	2017		**2018**		**2019**		**Total**	
	Total	*%*	*Total*	*%*	*Total*	*%*	*Total*	*%*
CSR tweets	92	100%	83	100%	95	100%	270	100%
CSR tweets with responses	13	14%	11	13%	21	22%	45	17%
CSR tweets with @PortOfRotterdam-user dialogue	*0*		*0*		*0*		*0*	

Source: Authors' elaboration

Overall, the small share of CSR-related tweets, especially in 2019, could be due to the use of Twitter for principally business-to-business communication purposes. In other terms, the PMB of Rotterdam uses Twitter as a channel to disseminate rapid and unemotional messages for mainly

informative purposes. This is also confirmed by the results reported in Table 5.4 regarding the analysis of interactive CSR-related tweets. Only 17% of the tweets published by @PortOfRotterdam in the investigated timeframe receives responses from other users and the @PortOfRotterdam never replied to them. Thus, no interaction with stakeholders on CSR issues is created, corroborating Twitter is only a CSR informative channel.

According to the empirical results, the paper would pave the way for developing a broader and more structured stream of literature addressing social media communication strategies performed by PMBs and for investigating the potential role of social media when disclosing their CSR commitment and initiatives. Nonetheless, the manuscript still suffers several limitations. First, it investigates social media adoption of only European PMBs, and thus a wider sample should be examined to further understand the role of several variables (e.g., port size, cultural cluster, port governance settings, human and financial resources available for social media, managerial style of the organisation, etc.) in shaping the attitude of PMBs towards digital communication. Second, the study reports findings related to a single case study (i.e., the use of Twitter by the Port of Rotterdam). Although it provides a valuable and replicable methodology to perform the analysis of CSR-related contents, comparative multiple-case studies should be examined as well as diverse social media platforms to validate the empirical results.

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Appendices

Data of the following appendices were gathered in February 2020.

Appendix 5.1. Facebook database.

Ranking	Port	Port dimension	Cultural cluster	Adoption	Registration	Followers	Uploaded photos	Uploaded videos	Uploaded media contents
1	Rotterdam	Large	Germanic Europe	Yes	2012	14.446	1.140	207	1.347
2	Antwerp	Large	Germanic Europe	Yes	2013	15.670	1.066	98	1.164
3	Hamburg	Large	Germanic Europe	Yes	2012	14.727	285	10	295
4	Amsterdam	Medium	Germanic Europe	Yes	2013	5.439	367	107	474
5	Algeciras	Medium	Latin Europe	Yes	2011	3.981	659	23	682
6	Marseille	Medium	Latin Europe	Yes	2015	2.545	521	31	552
7	Le Havre	Medium	Latin Europe	Yes	2013	2.327	710	11	721
8	Valencia	Medium	Latin Europe	No	2018	110	12	0	12
9	Trieste	Medium	Latin Europe	No	n.a.	n.a.	n.a.	n.a.	n.a.
10	Immingham	Medium	Anglo Cultures	No	n.a.	n.a.	n.a.	n.a.	n.a.
11	Barcelona	Medium	Latin Europe	No	n.a.	n.a.	n.a.	n.a.	n.a.
12	London	Medium	Anglo Cultures	Yes	2011	4.152	1.226	10	1.236
13	Genoa	Medium	Latin Europe	Yes	2017	4.348	1.098	27	1.125
14	Bremerhaven	Medium	Germanic Europe	Yes	2019	970	135	9	144
15	Piraeus	Medium	Eastern Europe	No	n.a.	n.a.	n.a.	n.a.	n.a.
16	Bergen	Small	Nordic Europe	Yes	2018	1.000	87	8	95
17	Sines	Small	Latin Europe	Yes	2016	14.807	4.588	5	4.593
18	Dunkerque	Small	Latin Europe	Yes	2010	7.307	963	88	1.051
19	Goteborg	Small	Nordic Europe	Yes	2016	624	81	52	133
20	Constanta	Small	Eastern Europe	Yes	2015	4.320	1.632	27	1.659
21	Southampton	Small	Anglo Cultures	No	n.a.	n.a.	n.a.	n.a.	n.a.
22	Riga	Small	Nordic Europe	Yes	2013	2.355	912	62	974
23	Milford Haven	Small	Anglo Cultures	Yes	2012	3.192	805	11	816
24	Tees & Hartlepool	Small	Anglo Cultures	No	n.a.	n.a.	n.a.	n.a.	n.a.
25	Wilhelmshaven	Small	Germanic Europe	No	n.a.	n.a.	n.a.	n.a.	n.a.
	Sample rate			**68%**	**2014**	**5.684**	**905**	**44**	**949**

Source: authors' elaboration

Appendix 5.2. Twitter database.

Ranking	Port	Port dimension	Cultural cluster	Adoption	Registration	Followers	Tweets
1	Rotterdam	Large	Germanic Europe	Yes	2009	23837	5252
2	Antwerp	Large	Germanic Europe	Yes	2009	15300	5334
3	Hamburg	Large	Germanic Europe	Yes	2010	4220	39700
4	Amsterdam	Medium	Germanic Europe	Yes	2010	5956	1681
5	Algeciras	Medium	Latin Europe	Yes	2012	6770	1636
6	Marseille	Medium	Latin Europe	No	n.a.	n.a.	n.a.
7	Le Havre	Medium	Latin Europe	Yes	2014	1776	675
8	Valencia	Medium	Latin Europe	Yes	2015	4229	3259
9	Trieste	Medium	Latin Europe	Yes	2015	3494	2367
10	Immingham	Medium	Anglo Cultures	Yes	2012	539	2956
11	Barcelona	Medium	Latin Europe	Yes	2009	11800	18100
12	London	Medium	Anglo Cultures	Yes	2010	18200	24100
13	Genoa	Medium	Latin Europe	Yes	2019	166	165
14	Bremerhaven	Medium	Germanic Europe	Yes	2015	291	166
15	Piraeus	Medium	Eastern Europe	Yes	2019	10	n.a.
16	Bergen	Small	Nordic Europe	Yes	2018	208	107
17	Sines	Small	Latin Europe	Yes	2016	2384	1163
18	Dunkerque	Small	Latin Europe	Yes	2012	3017	3222
19	Goteborg	Small	Nordic Europe	Yes	2011	2751	3801
20	Constanta	Small	Eastern Europe	Yes	2015	209	243
21	Southampton	Small	Anglo Cultures	Yes	2015	341	8
22	Riga	Small	Nordic Europe	No	n.a.	n.a.	n.a.
23	Milford Haven	Small	Anglo Cultures	Yes	2011	3151	3366
24	Tees & Hartlepool	Small	Anglo Cultures	Yes	2012	539	2956
25	Wilhelmshaven	Small	Germanic Europe	No	n.a.	n.a.	n.a.
		Sample rate		**88%**	**2013**	**4.963**	**5.727**

Source: authors' elaboration

Appendix 5.3. Instagram database.

Ranking	Port	Port dimension	Cultural cluster	Adoption	Registration	Followers	Uploaded photos/videos
1	Rotterdam	Large	Germanic Europe	Yes	2018	6.544	263
2	Antwerp	Large	Germanic Europe	Yes	2013	7.396	490
3	Hamburg	Large	Germanic Europe	Yes	2015	12.400	306
4	Amsterdam	Medium	Germanic Europe	Yes	2019	1.054	45
5	Algeciras	Medium	Latin Europe	No	n.a.	n.a.	n.a.
6	Marseille	Medium	Latin Europe	Yes	2018	893	243
7	Le Havre	Medium	Latin Europe	Yes	2018	514	16
8	Valencia	Medium	Latin Europe	Yes	2018	639	27
9	Trieste	Medium	Latin Europe	Yes	2015	1.326	357
10	Immingham	Medium	Anglo Cultures	Yes	2017	909	293
11	Barcelona	Medium	Latin Europe	No	n.a.	n.a.	n.a.
12	London	Medium	Anglo Cultures	Yes	2017	1.409	132
13	Genoa	Medium	Latin Europe	Yes	2019	292	14
14	Bremerhaven	Medium	Germanic Europe	Yes	2019	879	79
15	Piraeus	Medium	Eastern Europe	Yes	2018	128	2
16	Bergen	Small	Nordic Europe	Yes	2018	543	50
17	Sines	Small	Latin Europe	No	n.a.	n.a.	n.a.
18	Dunkerque	Small	Latin Europe	No	n.a.	n.a.	n.a.
19	Goteborg	Small	Nordic Europe	Yes	2015	2.301	757
20	Constanta	Small	Eastern Europe	No	n.a.	n.a.	n.a.
21	Southampton	Small	Anglo Cultures	No	n.a.	n.a.	n.a.
22	Riga	Small	Nordic Europe	Yes	2013	880	150
23	Milford Haven	Small	Anglo Cultures	No	n.a.	n.a.	n.a.
24	Tees & Hartlepool	Small	Anglo Cultures	Yes	2017	909	293
25	Wilhelmshaven	Small	Germanic Europe	No	n.a.	n.a.	n.a.
	Sample rate			**68%**	**2017**	**2.295**	**207**

Source: authors' elaboration.

Appendix 5.4. YouTube database.

Ranking	Port	Port dimension	Cultural cluster	Adoption	Registration	Subscriber	Uploaded videos
1	Rotterdam	Large	Germanic Europe	Yes	2009	9.910	489
2	Antwerp	Large	Germanic Europe	Yes	2009	1.430	194
3	Hamburg	Large	Germanic Europe	Yes	2010	5.460	455
4	Amsterdam	Medium	Germanic Europe	Yes	2012	436	122
5	Algeciras	Medium	Latin Europe	No	n.a.	n.a.	n.a.
6	Marseille	Medium	Latin Europe	Yes	2015	170	63
7	Le Havre	Medium	Latin Europe	No	n.a.	n.a.	n.a.
8	Valencia	Medium	Latin Europe	Yes	2014	197	121
9	Trieste	Medium	Latin Europe	Yes	2017	39	61
10	Immingham	Medium	Anglo Cultures	Yes	2013	45	38
11	Barcelona	Medium	Latin Europe	No	n.a.	n.a.	n.a.
12	London	Medium	Anglo Cultures	Yes	2010	n.a.	110
13	Genoa	Medium	Latin Europe	Yes	2015	107	206
14	Bremerhaven	Medium	Germanic Europe	No	n.a.	n.a.	n.a.
15	Piraeus	Medium	Eastern Europe	No	n.a.	n.a.	n.a.
16	Bergen	Small	Nordic Europe	No	n.a.	n.a.	n.a.
17	Sines	Small	Latin Europe	Yes	2019	63	74
18	Dunkerque	Small	Latin Europe	Yes	2011	69	33
19	Goteborg	Small	Nordic Europe	No	2011	63	21
20	Constanta	Small	Eastern Europe	No	n.a.	n.a.	n.a.
21	Southampton	Small	Anglo Cultures	No	n.a.	n.a.	n.a.
22	Riga	Small	Nordic Europe	Yes	2010	31	100
23	Milford Haven	Small	Anglo Cultures	No	n.a.	n.a.	n.a.
24	Tees & Hartlepool	Small	Anglo Cultures	Yes	2013	45	38
25	Wilhelmshaven	Small	Germanic Europe	No	n.a.	n.a.	n.a.
	Sample rate			**56%**	**2013**	**1.290**	**142**

Source: authors' elaboration

Appendix 5.5. LinkedIn database.

Ranking	Port	Port dimension	Cultural cluster	Adoption	Followers	Registered employees
1	Rotterdam	Large	Germanic Europe	Yes	47.728	1.206
2	Antwerp	Large	Germanic Europe	Yes	29.969	797
3	Hamburg	Large	Germanic Europe	Yes	2.507	n.a.
4	Amsterdam	Medium	Germanic Europe	Yes	9.118	287
5	Algeciras	Medium	Latin Europe	Yes	4.516	36
6	Marseille	Medium	Latin Europe	Yes	9.182	215
7	Le Havre	Medium	Latin Europe	Yes	999	201
8	Valencia	Medium	Latin Europe	Yes	3.248	139
9	Trieste	Medium	Latin Europe	Yes	1.461	20
10	Immingham	Medium	Anglo Cultures	Yes	7.051	444
11	Barcelona	Medium	Latin Europe	Yes	11.519	231
12	London	Medium	Anglo Cultures	Yes	6.374	270
13	Genoa	Medium	Latin Europe	Yes	1.450	53
14	Bremerhaven	Medium	Germanic Europe	No	n.a.	n.a.
15	Piraeus	Medium	Eastern Europe	Yes	471	101
16	Bergen	Small	Nordic Europe	No	6	n.a.
17	Sines	Small	Latin Europe	Yes	574	42
18	Dunkerque	Small	Latin Europe	Yes	4.101	123
19	Goteborg	Small	Nordic Europe	Yes	5.539	156
20	Constanta	Small	Eastern Europe	No	n.a.	n.a.
21	Southampton	Small	Anglo Cultures	No	n.a.	n.a.
22	Riga	Small	Nordic Europe	Yes	84	33
23	Milford Haven	Small	Anglo Cultures	Yes	1.821	95
24	Tees & Hartlepool	Small	Anglo Cultures	Yes	7.051	444
25	Wilhelmshaven	Small	Germanic Europe	No	n.a.	n.a.
	Sample rate			**80%**	**7.370**	**258**

Source: authors' elaboration

CHAPTER 6

GREEN STRATEGIES IN THE CRUISE INDUSTRY: FROM THEORY TO PRACTICE

6. Green strategies in the cruise industry: from theory to practice

Satta, G., Parola, F., Morchio, G. and Vitellaro, F (2020). Green strategies in the cruise industry: from theory to practice, *The Cartagena dialogue on Cruise, Ports and Cities*[7].

Abstract

Since the early-1980s, the cruise market has been experiencing a relentless demand expansion, with two-digit growth rates – considering the period before the outbreak of the COVID-19 pandemic. This trend has been accompanied by an increasing interest of civil society in the social and environmental externalities generated by cruise lines. Due to the increasing stakeholders' pressure, cruise lines are expected to be more responsible, especially when their itineraries call densely populated cruise port destinations or territories characterised by a fragile environment. For this reason, major cruise lines are developing green strategies to mitigate the negative impacts on the environment and strengthen their relationship with salient stakeholders according to corporate social responsibility theoretical constructs. In this perspective, the paper aims to deepen knowledge on green strategies of cruise lines as well as to disentangle the environmental benefits associated with the new technological solutions. It develops an original conceptual framework to identify and evaluate the most promising green investment options according to five categories of green strategies. Environmental benefits, as well as managerial weaknesses and strengthens associated with each green investment option, are debated and compared. Finally, the original conceptual framework is empirically tested on multiple case studies to examine the current state of the art in the cruise industry as well as the real commitment of major cruise lines to green strategies.

Keywords: green strategies; CSR; cruise industry; environmental benefits; green investment options.

[7] The final version of the research paper reported in this PhD manuscript refers to the submission for the Special Issue "Cruise Shipping, Ports, and Destinations", Research in Transportation Business & Management (Elsevier); the research paper is under review.

6.1. The rationale of the study

Since the beginning of the ’80s, the cruise market has been experiencing non-stop growth, with two-digit performance: the amount of global cruise passengers has almost doubled from 17.8 million in 2009 to 30 million in 2019 (CLIA, 2020). This trend has been accompanied by an increasing interest in civil society towards the implications and externalities of the business (Brida and Zapata, 2010). Scholars and experts are still debating on the net balance between positive spill-overs, including both direct and indirect effects in cruise port destinations (Parola et al., 2014), and negative implications related to environmental and socio-cultural concerns (Dwyer and Forsyth, 1998; Satta et al., 2015; MacNeill, T., and Wozniak, 2018). Environmental implications rank first among the urgencies of the industry. They deal with water consumption, wastewater treatment systems, emissions from engines/auxiliary systems, effluents, and solid waste, and impacts on biodiversity. Nonetheless, socio-cultural concerns are recently emerging as potential troubles. Human rights protection and employment conditions in the industry have been questioned as well as the health and safety of crew members and passengers, especially after the outbreak of the COVID-19 pandemic which has been imposing additional pressure on cruise lines for developing sustainable growth strategies. Overcrowding in cruise port destinations and homogenisation of cruise experiences are also ruining the authenticity of local cultures and the quality of life of local inhabitants (Klein, 2011).

Given the above, cruise lines’ competitiveness is expected to be increasingly affected by their ability to provide “sustainable” products and experience to customers as well as to pursue green strategies capable to eliminate, or at least reduce, the environmental impacts of day-by-day operations. In this vein, cruise lines can strengthen their value proposition according to customers’ expectations and gain the license to operate from salient stakeholders. Public concern about the environment has soared to record levels in many countries, especially in Europe. The cruise industry is not exempt, and its environmental impact is at the heart of the international debate. Cruise lines’ stakeholders have shown an increasing awareness of the externalities generated by the industry which threaten their well-being and quality of life. Amongst them, local communities of cruise port destinations are more demanding and eager to obtain information about cruise lines’ green performance and initiatives. Moreover, policymakers worldwide have recently issued stringent regulations addressing harmful emissions of the whole shipping industry in line with the greener policy trajectories of the International Maritime Organisation (IMO). As a result, the environment appears as the most burning issue for cruise lines that are challenged to meet their stakeholders’ requirements to achieve social approval and license to operate.

In this perspective, green strategies constitute a valuable opportunity for differentiating cruise tourism offers and making it more sustainable. However, the achievement of these goals requires not only to fully integrate stakeholder relationship management (SRM) and corporate social responsibility (CSR) paradigms in the strategic decision-making process of cruise lines but also technical knowledge for selecting the most efficient/effective green investment options. For this purpose, the paper aims to deepen knowledge on the green strategies of cruise lines. It develops an original conceptual framework to disentangle weaknesses and strengthens related to viable and promising technologies for making cruise lines' strategies more sustainable. Then, the original conceptual framework is tested on multiple case studies to evaluate the current state of the art in the industry as well as the real commitment of cruise lines to green strategies.

The paper is structured as follows. Section 2 provides a taxonomy of environmental impacts originating from the cruise business, grounding on a review of the main contributions in academic literature. Section 3 reports the original conceptual framework which consists of five categories of green strategies. Alternative investment options for each category are compared and discussed to highlight achievable environmental benefits. Section 4 presents the case studies on three of the major cruise lines worldwide (i.e., Royal Caribbean, Norwegian Cruise Line, and Carnival Corporation). The empirical results are discussed in Section 5. Limitations and conclusions are provided in Section 6.

6.2. Literature review

6.2.1. The environmental impact of cruise lines

Although cruise lines have made many steps forward in green strategies and practices urgent interventions are still required. The cruise industry is considered one of the most polluting in tourism and a serious threat to maritime cities and local communities (Amelung and Lamers, 2007). A recent study by Ruiz-Guerra et al. (2019) shows air pollution from the cruise, especially ground-level ozone (O3) and particulate matter (PM), are an urgent concern for maritime cities. Long exposure to such emissions can provoke lung cancers, cardiovascular illnesses, and other respiratory problems (e.g., asthma). Therefore, SOx emissions and other types of PM can heavily affect the health of local communities of maritime cities and all living organisms worldwide (UNEP, 2019). Although the intensity of air pollution from fuel combustion is higher during navigation in the open sea, Carić and Mackelworth (2014) argue emissions at the berth of cruise ships are considerable. They need to keep engines running during their stay at the port to provide passengers with all onboard services. This causes additional pollution in coastal regions and exposes local communities to further risks. Miola and Ciuffo (2011) estimate 30% of smog in

port cities comes from ships. This is intensified by the emissions from waste incinerators of cruises, which may include dioxins and thiophenes (Klein, 2003; Copeland, 2008). Due to the lack of space, many cruise lines have installed onboard waste incineration systems, especially for itineraries where ports do not have appropriate disposal facilities (Carić and Mackelworth, 2014). This reduces the waste dumped into the sea, but it significantly increases harmful air emissions and ashes. Moreover, the incineration of specific solid waste, such as plastic packaging, generates dioxins, which are particularly dangerous not only for human health but also for the environment (Klein, 2003). Indeed, they result in acid rain which harms green coastal areas and alter the pH of water (Hall-Spencer and Rodolfo- Metalpa, 2012).

Recent studies demonstrate that the whole shipping industry accounts for 2.2% of global greenhouse gasses (GHGs) emissions (3rd IMO GHG Study, 2014), responsible for climate change. Cruises lines are estimated to contribute up to 10% of all ship CO_2 emissions within the Mediterranean Sea (Faber et al., 2009). A study by the international association of Transport & Environment (2019) estimates the CO_2 emissions from cruise ships in Europe in 2017 was over 10 kt, on par with the total national GHG emissions of Latvia, Luxembourg, and Cyprus.

Air emissions and pollution are not the only environmental concerns related to the cruise industry. Water pollution, waste management, noise emissions, and impacts on biodiversity are some of the main open issues which have triggered several academics to investigate the main environmental impacts generated by the industry. Extant literature on this topic appears nowadays solid and robust as reported in Table 6.1.

In 2008, the United States Environmental Protection Agency (USEPA) estimates the waste of cruise ships vary from 2.6 to 3.5 kg/person/day. It is a mix of organic and inorganic compounds with a portion of hazardous substances such as cleaners, paints, and medicines (Copeland, 2008). While organic waste can be legally disposed of beyond 12 nautical miles from the coast, inorganic waste is often dumped at sea due to the lack of control by governments (Carić and Mackelworth, 2014). Thompson et al. (2004) argue plastics, which are making up 60/80% of marine litter worldwide, is becoming an unsustainable issue in shipping (around 24% of all waste produced by the industry), especially in the cruise segment. Besides, hazardous waste and wastewater represent a major risk for the marine environment. The hazardous waste consists of ignitable, corrosive, reactive or toxic waste which often ends up in the sea due to intentional or uncontrolled dumping (Klein, 2003).

Table 6.1. Literature review: main contributions on cruise environmental impacts.

Authors	Year	Title	Source	Main environmental impacts debated
Paiano A., Crovella T., Lagioia G.	2020	Managing sustainable practices in cruise tourism: the assessment of carbon footprint and waste of water and beverage packaging	Tourism Management	GHG emissions; Waste and Effluents
Sanches V.L., Aguiar M.R.D.C.M., de Freitas M.A.V., Pacheco E.B.A.V.	2020	Management of cruise ship-generated solid waste: A review	Marine Pollution Bulletin	Waste and Effluents
Perić, T., Golub-Medvešek, I.	2019	Analysis of cruise ship traffic in the Port of Split	Journal of Applied Engineering Science	Biodiversity; Waste and Effluents
Ruiz-Guerra I., Molina-Moreno V., Cortés-García F.J., Núñez-Cacho P.	2019	Prediction of the impact on air quality of the cities receiving cruise tourism: the case of the Port of Barcelona	Heliyon	Air pollutants
López-Aparicio S., Tønnesen D., Thanh T.N., Neilson H.	2017	Shipping emissions in a Nordic port: Assessment of mitigation strategies	Transportation Research Part D: Transport and Environment	Air pollutants; GHG emissions
Papaefthimiou S., Maragkogianni A., Andriosopoulos K.	2016	Evaluation of cruise ships emissions in the Mediterranean basin: The case of Greek ports	International Journal of Sustainable Transportation	Air pollutants; GHG emissions
Ballini F., Bozzo R.	2015	Air pollution from ships in ports: The socio-economic benefit of cold-ironing technology	Research in Transportation Business and Management	Air pollutants; Energy
Carić H., Mackelworth P.	2014	Cruise tourism environmental impacts - The perspective from the Adriatic Sea	Ocean and Coastal Management	Air pollutants; Biodiversity; GHG emissions; Waste end Effluents
Jing L., Chen B., Zhang B., Peng H.	2012	A review of ballast water management practices and challenges in harsh and arctic environments	Environmental Reviews	Waste and Effluents
Klein R.A.	2011	Responsible cruise tourism: Issues of cruise tourism and sustainability	Journal of Hospitality and Tourism Management	Air pollutants; Biodiversity; Light pollution; GHG emissions; Noise pollution; Waste end Effluents
Poplawski K., Setton E., McEwen B., Hrebenyk D., Graham M., Keller P.	2011	Impact of cruise ship emissions in Victoria, BC, Canada	Atmospheric Environment	Air pollutants
Tzannatos E.	2010	Ship emissions and their externalities for the port of Piraeus - Greece	Atmospheric Environment	Air pollutants
Eijgelaar E., Thaper C., Peeters P.	2010	Antarctic cruise tourism: The paradoxes of ambassadorship, last chance tourism and greenhouse gas emissions	Journal of Sustainable Tourism	GHG emissions
Copeland, C	2008	Cruise ship pollution: Background, laws and regulations, and key issues.	Washington, DC: Congressional Research Service.	Biodiversity; Waste and Effluents
Klein, R. A.	2003	Cruising Out of Control: The Cruise Industry, The Environment, Workers, and the Maritimes.	Canadian Centre for Policy Alternatives	Air pollutants; Biodiversity; GHG emissions; Waste end Effluents

Source: authors own elaboration

When it comes to wastewater, only blackwaters are recognized as a contaminant by current regulation. However, Perić (2016) demonstrates water pollution in ports and coastal areas mainly comes from greywaters (e.g., wastewater from cabin sinks and showers, laundering, galley sinks, etc.), which are not included among the pollutants of the MARPOL Convention. Both black and grey waters are extremely dangerous for living organisms and complex ecosystems, such as coral reefs, estuaries, saltwater and freshwater marshes, and mangroves (Kay, 1989).

Another environmental concern is ballast water which is used for the stabilisation of cruise vessels during navigation. During load and discharge of ballast water at ports of call along the itinerary, cruises may accidentally transport invasive species from one place to another causing severe damage to marine biodiversity (Copeland, 2008).

Table 6.2. Taxonomy of the main environmental impacts generated by the cruise industry.

Environmental impact	Description
Air pollutants	Nitrogen oxides (NO_X), sulphur oxides (SO_X), and other significant air emissions; Combustion emissions from burning waste.
Biodiversity	Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas; Significant impacts of activities, products, and services on biodiversity, habitats protected or restored; IUCN Red List species and national conservation list species with habitats in areas affected by operations; Direct or indirect impacts on biodiversity (species affected, area impacted, duration of impacts, reversibility or irreversibility impacts).
Effluents and Waste	Waste by type and disposal method; Significant spills; Transport of hazardous waste; Total waste excluding recycling value; Waste in shipboard incinerators; Waste generated in operation; Waste-to-landfill per passenger.
Energy	Energy consumption (electric consumption; heating consumption; cooling consumption; steam consumption) inside and outside the organisation; Energy intensity and reduction of consumption; Energy efficiency.
GHG emissions	Direct GHG emissions (from fuel to propel the ships and run the ships generators to provide electricity); Energy indirect GHG emissions (from ship refrigerants to cool appliances such as refrigerators and air conditioning units on the ships); Other indirect GHG emissions; GHG emissions intensity; Reduction of GHG emissions; Emissions of ozone-depleting substances; Shore direct GHG emissions from electricity purchased at the port of call for power the ship while docked (cold ironing) or for power the corporate and brands headquarters buildings and the land-based hotels.
Light pollution	Light pollution, both at sea and at port; Distresses and harms to animal species and other living beings.
Materials	Non-renewable materials used; Percentage of non-recycled input materials; Percentage of non-reclaimed products and their packaging materials.
Noise pollution	Noise emissions, especially at port and near densely populated area; Underwater noise emission.
Water and Effluents	Management of water discharge-related impacts; Water consumption. Water withdrawal from different sources (ocean; river; rainwater, etc.); Water consumption from shoreside operations; Disposal of oil bilge water, black water and grey water; Usage of potable water.

Source: adapted from GRI and CDP reporting standards.

Cruise lines raise also concerns about noise and light pollution (Klein, 2011). Noise is not only harmful to people living in the surrounding port area, but also to many marine species (Hildebrand, 2009). Indeed, the main sources of submarine noise consist of ship traffic and low-frequency navy sonars (Rako et al., 2012). Erbe et al. (2019) demonstrate the impact of noise pollution from cruises on marine mammals, especially in the coastal area. On the other hand, light pollution from cruises is disruptive, especially for nocturnal species. For example, the lights of cruises may disorient migrating birds whereas zooplankton, cephalopods and fishes can confuse these sources for natural lights and, thus, be exposed to intensive and frequent predation (Longcore and Rich, 2004), whereas the lights along the seashore can disturb the nesting of sea turtles (Bourgeois et al., 2009).

In line with the environmental issues debated in academic literature, the paper provides an overarching taxonomy of the principal cruise environmental impacts (Table 6.2). It also considers the latest global reporting standards of the Global Reporting Initiative (GRI) and the Carbon Disclosure Project (CDP). Notably, GRI and CDP provide organisations with standards for sustainability reporting which can be used to analyse their environmental performance. In this perspective, the taxonomy reports a description of each category which also includes the main parameters adapted from GRI and CDP reporting standards to monitor and measure the environmental externalities generated by cruise lines.

6.2.2. Green strategies in the cruise industry

The cruise industry is at a turning point: the growing environmental impacts and related expectations of stakeholders are challenging cruise lines to adopt new green strategies for being more sustainable and competitive (Wang et al., 2019). in 2018 the Cruise Lines International Association (CLIA) has announced the commitment of the entire industry to reduce the carbon footprint by 40% by 2030. CLIA's Environmental Technologies and Practice Report (2019) shows the significant progress of cruise lines towards the adoption of green and innovative practices. Amongst them, Liquified Natural Gas (LNG), Exhaust Gas Cleaning Systems (EGCS), Advanced Wastewater Treatment Systems (AWTS) and Shore-side Power are argued as the most mature and diffused solutions in the sector (Ballini and Bozzo, 2015). Cruise lines are also investing in new promising environmentally friendly technologies, such as advanced recycling practices, solar energy, fuel cell and energy-efficient lighting which have the potential to cut waste and emissions.

Pakbeen (2018) argues the efforts of cruise lines in green strategies are mainly the result of two drivers: (i) the stringent international regulation, aiming at reducing the environmental impact of

the whole shipping industry (see for example the recent revision of MARPOL Annex VI on sulphur emissions), and (ii) the increasing attention of cruise lines towards their stakeholders' requirements. Green policies triggered by societal pressure are pushing cruise lines to invest in green technologies for being compliant with the new standards (Pallis and Vaggelas, 2019). However, they are going the extra mile to overtake current regulations voluntarily for meeting stakeholders' expectations.

According to CSR and SRM theoretical constructs (Carroll, 1991; Freeman, 2010), cruise lines aim to integrate sustainability and social values within their strategic and operational decision-making processes (Wang et al., 2019). It is widely believed, CSR represents an excellent driver to increase corporate legitimacy among stakeholders and to develop a positive corporate image (Carroll and Hoy, 1984). The strategic success of organisations, indeed, depends largely on the quality of relationships with both internal and external stakeholders (Freeman, 2010). In line with the modern stakeholder management approach, this suggests that organisations should broaden their goals to address a wide array of salient stakeholders, going further beyond complying with standards (Buysse and Verbeke, 2003).

The voluntary choice of cruise lines to implement green strategies is mainly due to the growing concern of their stakeholders for the environment and sustainable development (de Grosbois, 2016). Cruise lines have realised CSR is a strategy to meet stakeholders' requirements and to secure corporate success in the long run (Wang et al., 2019). In this perspective, previous studies demonstrate poor environmental performance can negatively affect the relationships with stakeholders (Buysse, and Verbeke, 2003). Consumers are more informed and aware of the environmental impact of products and services, and they are increasingly asking companies for green products (Buysse, and Verbeke, 2003). This also emerges in cruise tourism where passengers are looking for "green itineraries" and sustainable experiences (UNWTO, 2017). However, cruise lines must face not only the requests of their customers but also the requirements of local communities and societal groups of cruise port destinations that are afraid of the externalities generated by the business (Klein, 2011; Mowforth and Munt, 2015).

In this scenario, green strategies become a fruitful opportunity for cruise lines to reduce the huge environmental impact of their activities and support the management of the relationship with salient stakeholders for the social approval and licence to operate. Moreover, they enable cruise lines to differentiate services and experiences, increasing corporate brand and image.

Despite these general managerial benefits, academic literature does not provide a comprehensive taxonomy of environmental benefits related to each different technological solution. Therefore, the paper aims to deepen knowledge of viable and promising alternative green investment options,

providing academics and practitioners with a framework to evaluate and select the more efficient and effective solution for reducing the environmental impacts of cruise lines.

6.3. Green investment options for cruise lines

6.3.1. The original conceptual framework

Over the last years, investment decision processes have been including more comprehensive parameters along with traditional economic and financial criteria for evaluating the result of the investment in terms of environmental benefits.

Table 6.3. The original conceptual framework: green strategies and related environmental benefits.

Green strategies / investment options	Environmental benefits								
	Materials	*Energy*	*Water and Effluents*	*Biodiversity*	*GHG emissions*	*Air pollutants*	*Noise pollution*	*Effluents and Waste*	*Light pollution*
Ship propulsion systems and alternative fuels									
Technical solutions for energy and environmental efficiency									
Ballast water treatment systems									
Waste treatment systems									
Automation and digital intervention									

Source: author's elaboration.

Grounding on both extant academic literature and anecdotal evidence, the paper provides a taxonomy of green strategies which consists of five categories: i) ship propulsion systems and alternative fuels, ii) ballast water treatment systems, iii) technical solutions for energy and environmental efficiency, iv) waste treatment systems, v) automation and digital interventions. Each category is made of alternative technological solutions (i.e., green investment options) that are evaluated according to technical and managerial dimensions. Moreover, the paper develops an original conceptual framework (Table 6.3) to evaluate the environmental benefits associated with the selected green investment options according to the taxonomy of impacts reported in Table 6.2.

The following subsections examine in detail each category of green strategies and related investment options to highlight the achievable environmental benefits.

6.3.2. Ship propulsion systems and alternative fuels

Many green investment options address innovative ship propulsion systems (Table 6.4). This category of the green strategy includes Integrated Electric Propulsion (IEP), which constitutes the key building block on the way to the All-Electric Ship (AES) (Tzannatos, 2010), diesel-electric engines (Afon and Ervin, 2008), wind power for marine propulsion systems (Rutkowski, 2016), and alternative fuels, e.g., very-low and ultra-low sulphur fuel oil (VLSFO/ULSFO), LNG (Acciaro, 2014), biomass energy and biofuels (Herremans and Echegaray, 2018).

The IEP systems and AES solutions bring undoubted challenges in the cruise domain (Tzannatos, 2010). These electrical engines need to satisfy the energy demand of all onboard accommodation and leisure facilities, as well as to power the propulsion system (Boveri et al., 2018). Given the current international regulatory framework on the reduction of environmental impacts generated by the transport system, electric propulsion has become an appealing technology worldwide, considering the wide cut of harmful air emissions. AES solutions also enable cruise lines to introduce many practices and technologies to save energy and reduce emissions. They include practices such as Unit Commitment (UC), Power System Dispatch (PSD), Demand Side Management (DSM), and technologies such as Variable Frequency Drives (VFDs), Energy Storage Systems (ESS) which are widely used in many land-based applications. The most critical issue is the charging time and the amount of power required for a cruise ship, which can significantly vary concerning operational requirements and weather conditions. Therefore, the installation of energy storage systems can be advantageous to cover the fluctuating load variations and to increase the ship's operative efficiency, reliability, and flexibility.

The electric-diesel option for marine propulsion is very expensive, but it allows the achievement of multiple advantages, including the excellent manoeuvrability and station-keeping ability, the ease of engine reversing (by acting exclusively on the electric motor), the versatility/flexibility related to the location of the engine/gensets and propulsor, the efficient response to the need for electricity to on-board services, the reduced life cycle cost originating from the lower operational and maintenance costs (Borràs et al., 2014). Nonetheless, the electric-diesel option does not entirely solve problems related to harmful air emissions, such as PM, SO_x, NO_x, and GHGs, including CO_2. Conversely, it contributes to reducing noise emissions thanks to the acoustical decoupling of the engines from the hull.

Cruise lines are growingly investigating hybrid renewable energy systems, e.g., solar photovoltaic power (PV) and proton-exchange membrane (PEM) fuel cells (Ghenai et al., 2019). However, most of these technical solutions are still under development. Amongst them, wind energy is regarded as one of the most promising alternative energy sources in the whole shipping industry. One of the most diffused system, the Norsepower's wind propulsion technology (Rotor Sail Solution technology), allows reducing fuel consumptions by 2.6% through the use of a single rotor sail. Recently, the Auxiliary Sail Propulsion System (ASPS) developed by Windship Technology Ltd, uses the rotation of the shafts to develop a greater power engine to maximize its performances and fuel economy. Moreover, MSC Cruise has announced in 2020 a study on the feasibility of a wind-powered vessel in agreement with the French shipyard Chantiers de l'Atlantique for an innovative prototype ship class concept. As stated on the occasion of the "Choose France" event, this prototype could be based on the Silenseas[8] series that uses both sailing propulsion and dual-fuel engines.

When it comes to alternative marine fuels, cruise lines emerge as the most active players within the shipping business investing in low sulphur combustibles such as very-low and ultra-low sulphur fuel oils (VLSFO and ULSFO). Although these fuels are compliant with the new IMO regulation capping the global fuel sulphur limit at 0.50%, they still determine substantial air emissions and are far more expensive than traditional fuels, such as heavy fuel oil (HFO). Conversely, the liquefied natural gas (LNG) option for marine propulsion is capable to reduce air emissions significantly: 20-25% of GHG, 85% of NO_x emissions, 95% of PM, and 100% of SO_x emissions (Ren and Lützen, 2015; Cepeda et al., 2019). Empirical evidence demonstrates that LNG also determines considerable cost savings in operational costs (-35%) by combining lower energy consumption and low price of LNG (Burel et al., 2013). Consequently, a large proportion of the current cruise order book is equipped with LNG or LNG-ready engines. After AIDAnova, i.e. the first LNG-propelled cruise ship delivered in December 2018 and Costa Smeralda launched in December 2020 (both vessels belonging to the Carnival Group), in the next seven years, 25 LNG-propelled vessels will enter the market involving both leading cruise lines, such as Carnival Group (8+2 vessels), MSC Crociere (7), Royal Caribbean (3) and Walt Disney World Co (3), latecomers, such as TUI AG (2,) and independent cruise lines such as Ponant- Bridgepoint Advisers Ltd (1).

[8] Silenseas is a combination of sailing yacht and passenger ship: it offers the same passenger experience as larger cruise ship but with a gross tonnage of approximately 23,000 GT, a length overall of 210 m and 150 cabins for 300 guests. Thanks to the largest single sail by area in the industry, and the latest energy efficient technologies, Silenseas+ ships can cruise without emissions.

Table 6.4. Ship propulsion systems and alternative fuels: environmental benefits.

Green strategies	Investment options	Environmental benefits								
		Materials	Energy	Water and Effluents	Biodiversity	GHG emissions	Air pollutants	Noise pollution	Effluents and Waste	Light pollution
Ship propulsion systems and alternative fuels	Integrated Electric Propulsion (IEP)									
	Diesel-electric engines									
	Wind power									
	VLSFO/ULSFO									
	LNG							(with gas turbine)		
	Biomass/biofuel									
	Hydrogen power									

No environmental benefits
Low environmental benefits
High environmental benefits

Source: author's elaboration.

Biomasses are promising renewable energy sources for the shipping and cruise industry. Biomass energy can be produced by any material of organic-vegetable origin such as plants, trees, farming, as well as urban or industrial waste (Florentinus, 2012). Among the most diffused biofuels, Fatty Acid Methyl Esters (FAME) is biodiesel which is assimilated to gasoline (Brynolf et al., 2014). The current adoption of biofuel by the cruise industry has regarded predominantly a low blend of biodiesel in petroleum diesel (from 5% to 20%), as it can be used in marine engines without any modifications. However, full biodiesel adoption has been tested, for example by RCCL on the «Jewel of The Seas» cruise ship, which is equipped with GE LM2500 gas turbines (Opdal and Hojem, 2007). Moreover, Hurtigruten, a well-known Norwegian cruise line, has recently started to test biofuels sourced from waste cooking oil, soya, corn, wheat and tallow on the ship "MS Polarlys". Empirical findings suggest that GHG emissions can be reduced by up to 95%. The main advantages of biofuels include not only a decrease in harmful emissions but also the improvement of cruise lines' economic and financial performances. Indeed, they improve engine performance and reduce fuel consumption as well as ensure access to biofuel tax schemes (for example in the United States).

Finally, hydrogen-powered cruise ships have also entered in R&D project plans of leading cruise lines, including Viking Cruises and AIDA Cruises because of the huge environmental benefits associated. However, this technology is considered a viable option only for small-sized vessels

(i.e., maximum of 900 passengers) and it needs further development for being widely used in the industry.

6.3.3. Technical solutions for energy and environmental efficiency

The second group of green strategies includes all investment options focused on the reduction of energy consumption and related negative environmental impacts (Table 6.5). Most promising green investment options for cruise lines are argued to be the Exhaust Gas Cleaning System (i.e., scrubber), hull air lubrication (i.e., "*bubble technology*"), fuel-saving propeller attachment, new bulbous bow (*nose job*), fuel-saving technologies, Heating Ventilation and Air Conditioning (HVAC), eclectic energy efficiency systems, solar power, and cold ironing.

Exhaust Gas Cleaning (EGC) systems enable the removal of sulphur oxides from the ship's engine and boiler exhaust gases, improving the quality of air emissions (Pakbeen, 2018). They include both "wet" and "dry" solutions which are commonly located on ship's funnels: the former removes pollutant particles from the gaseous stream using liquid substances, while the latter is used to remove acid gases primarily from combustion sources. Wet scrubbers use a scrubbing liquid that removes the pollutants: the exhaust gas is moved through the scrubbing liquid (usually in a chamber) and the liquid is misted through the gas. The heavier pollutants are pulled out of the exhaust gas and attached to the liquid because of its chemical composition. The contaminants flow into a "pollutant liquid" that is funnelled away and collected for specialized disposal. On the other hand, dry scrubbers introduce a series of dry reactants to exhaust gas at high speeds to neutralize the pollutants in the gas. Three technological solutions are commonly adopted in the cruise domain, i.e., open, closed, and hybrid scrubber. Open-loop scrubbers use seawater for the cleaning process: after scrubbing the exhaust gas, the water is treated and released into the sea. This process poses special concerns related to water emission and may negatively impact marine ecosystems in the surface ocean or sea (Endres et al., 2018). Closed-loop systems employ fresh water treated with alkaline chemicals within the cleaning process. For this purpose, the water is re-used during the operations by adding a slight proportion of water to overtake issues related to natural burn off. The water used in the process then sent to water treatment plants before being released into the ocean. Hybrid scrubbers are typically designed for operating in either the open or closed-loop mode, being capable to shift from using freshwater to seawater.

Although the reduction of harmful air emissions, scholars have raised concerns about the chemical composition of the scrubber effluents, especially for open-loop scrubbers (Endres et al., 2018). Polycyclic hydrocarbons (PAHs), heavy metals and an increased concentration of nitrate deriving from this process are argued to be dangerous for the environment (Hansen, 2012). Moreover,

scrubbers do not reduce the emissions of NO_2, which are an urgent issue in coastal areas (Aulinger et al., 2016). Finally, scrubbers raise an issue related to operational and financial dimensions. Capital Expenditures (CAPEX) originating from these investments may range from 2 to 5 million per vessel. They also reduce the vessel's capacity, which a critical factor in the cruise business, and require a long period to be installed, forcing the inactivity for the ship asset.

Table 6.5. Technical solutions for energy: environmental benefits.

Green strategies	Investment options	Environmental benefits								
		Materials	Energy	Water and Effluents	Biodiversity	GHG emissions	Air pollutants	Noise pollution	Effluents and Waste	Light pollution
Technical solutions for energy and environmental efficiency	Exhaust Gas Cleaning System (scrubber)								possible negative impact	
	Hull air lubrification (bubble technology)									
	Fuel saving propeller attachment									
	New bulbous bow (nose job, goose neck bulb)									
	Fuel Saving Technology									
	Retrofit Heating, Ventilation and Air Conditioning (HVAC) system									
	Electric energy efficiency systems									
	Solar power									
	Cold ironing									

No environmental benefits	
Low environmental benefits	
High environmental benefits	

Source: author's elaboration.

When it comes to energy efficiency in the cruise industry, a wide array of technical solutions addresses the reduction of fuel consumption without acting on the main engine. Among them, air lubrication is argued to hold high potential. The so-called "bubble technology" is a viable technology for reducing the frictional resistance of waterborne cruise vessels, through the production of real air bubbles in the lower section of the hull of the ship (Silberschmidt et al., 2016). Air lubrication can reduce fuel consumption by 5-10% as well as CO_2 emissions up to 15%.

Innovative ship design is another valuable green investment option for cruise vessels. Fuel-saving propeller attachment devices, such as "Hi-FIN", allow generating countering swirls to offset the

swirls created by the propeller. Therefore, this equipment improves propulsion efficiency up to 2.5% and contribute to reducing air emissions as well as noise pollution.

To improve the resistance performance and energy efficiency of cruise ships, both gooseneck bulbs and "nose job" related to the ship's bulbous bow is available technological solutions (Yu et al. 2014). The nose job generates a reduction of CO_2 emissions by more than 20% and of fuel consumption by 10%. From a managerial perspective, this option is valuable for new building, since existing vessels may require significant refitting. Main managerial concerns refer to capital expenditures and the timing for dry dock activities and the related loss in positive cash flows during the refitting.

Further fuel-saving technologies have been experienced in the cruise industry, including interior and passive design (McCartan et al., 2013). These investments aim to optimise fuel consumption generated by auxiliary systems, determining cost savings in terms of voyage costs (e.g., fuel costs) and operating costs (e.g., costs for day-by-day maintenance of auxiliary systems). For instance, ABB developed an Onboard Direct Current Grid system for reducing noise and trimming the environmental impacts related to the cruise ship. It allows engines to run at variable speeds for enhancing fuel consumption efficiency. Tests conducted by Pon Power in collaboration with ABB on Myklebusthaug Offshore's platform supply vessel "Dina Star" in 2020 have also registered a noise reduction of engine room up to 30% that contribute to improving onboard working conditions. In this context, Wartsila has developed the Low Loss Hybrid (LLH) System, an innovative technology that uses different power sources to operate the prime movers closest to their optimum performance.

Several different strategies for onboard photovoltaic/diesel energy systems have been tested in innovative research projects and pilot cases (Ancona et al., 2018). Both hybrid photovoltaic/diesel green ships operating in standalone and grid-connected modes have been considered. In their outstanding study, Yuan et al. (2018) develop an energy system made of a solar energy generation unit, a battery storage system, a diesel generating set, grid-tied/stand-alone controlled inverters, a battery management system (BMS) and an energy management system. This system uses solar energy to reduce fuel consumption by around 4% and carbon dioxide emissions by over 8.5%. Solar panels are also studied by STX Europe and Stirling Design International which are developing together with an innovative cruise ship (i.e., EOSEAS) that aims to reduce emissions using renewable sources of energy (Parnyakov, 2014).

Among technical solutions for energy and environmental efficiency, fuel cells and batteries play a key role. Fuel cells directly convert electrochemical energy into chemical energy from certain compounds into electric power. This transformation is carried out without a thermodynamic cycle.

Batteries are more complex components because they use a wide range of auxiliary systems for evacuating heat, reforming or feeding fuel or controlling the humidity in the electrolyte (de-Troya et al., 2015). As this technology becomes smaller and more efficient, the adoption of fuel cells in the ship's hotellerie functions is expected to increase in the future.

Another on-board energy efficiency tool for reducing environmental impact is the Heating, Ventilation and Air Conditioning (HVAC), which consists of upgrading old ventilation and air conditioning systems and inserting inverters (with variable frequency). This green investment option reduces electrical consumption and extends the economic life of the cruise vessel' equipment. This reduces unproductive energy consumptions and related negative environmental impacts. Given the magnitude of onboard utilities originating from cabins and common spaces for both passengers and crew members, HVAC systems are demonstrated to guarantee a reduction of 25% in the cooling consumption of cruise ships (Pakbeen, 2018).

Variable frequency drives (VFDs), which power motors for pumps, blowers, fans, and HVAC systems are rapidly spreading in the cruise industry (Su and Hong, 2013). This option includes a set of equipment capable of reducing energy consumption up to 80% and power losses up to 30% as well as improving cost saving. In this perspective, VFDs contribute to cut CO_2 emissions.

The last selected green investment option of this category is cold ironing, which is also called the Alternative Marine Power System (AMPS) or Shore-To-Ship Power Supply System (STSS). This technological solution provides electric energy to the cruise ships docked at the port: it enables onboard marine auxiliary engines with generators (gen-sets) to be shut down while ships are at berth (Yıldırım Pekşen and Alkan, 2018). Cold ironing is widely used in the cruise industry because it allows to carry out loading/unloading operations, powering all services on board. This significantly improves the quality of air in the surrounding area of the port, reducing harmful emissions into the atmosphere and also lowering noise pollution (Zis et al., 2014).

6.3.4. Ballast water treatment systems

Green strategies pursued by cruise lines increasingly involves investments for reducing water emissions and negative effects on local marine fauna and flora (Table 6.6). In this vein, wastewater and ballast water management systems constitute the most diffuse green investment option. Among wastewater treatment solutions, the Advanced Wastewater Purification System (AWWPS), designed to treat all types of maritime wastewater, is widely used by cruise lines (Klein, 2011). It allows to manage load changes and reduces the need for high capacity onboard tanks, increasing operational flexibility and limiting space waste.

Table 6.6. Ballast water treatment systems: environmental benefits.

Green strategies	Investment options	Environmental benefits								
		Materials	Energy	Water and Effluents	Biodiversity	GHG emissions	Air pollutants	Noise pollution	Effluents and Waste	Light pollution
Ballast water treatment systems	Advanced wastewater purification systems (AWWPS)									
	Ballast water exchange									
	Onboard treatment									

No environmental benefits	
Low environmental benefits	
High environmental benefits	

Source: author's elaboration.

Ballast water management systems aim to purify ballast water from all microorganisms and living species, preventing the spread of invasive species and dangerous bio-invasions (King et al., 2012). These systems include both ballast water exchange systems and ballast water treatment systems (BWTS) (Wright, 2007). The ballast water exchange consists of the process of emptying and filling the tanks dedicated to the ballast water, which can be performed according to a fixed frequency-based (i.e., complete emptying of the tanks and subsequent fulfilment with ocean waters) or continuously. Conversely, the BWTS require a primary and secondary treatment of ballast water. The primary treatment uses simple filtration and hydro-cyclones, while the secondary treatment uses chemical separation methodologies, biocides, chlorine, ozone, or mechanical separation methodologies, by ultraviolet, thermal, ultrasonic or magnetic solutions as well as electrical radiation. In the cruise industry, BWTS employs different solutions, including filtration and UV, filtration and chemical, deoxygenation and cavitation, electrolysis and electro-chlorination, filtration, deoxygenation, and cavitation (Tsolaki and Diamadopoulos, 2010).

6.3.5. Waste treatment systems

As the control and monitoring of waste generated onboard cruise ships is crucial for the prevention of marine pollution, an increasing number of cruise lines is engaged in waste management, from production to final destination, including harvesting, transport, treatment (recycling and disposal) and reuse of waste materials (Table 6.7).

Many cruise lines have introduced special waste reduction policies aiming at using resources carefully or reducing the consumption of plastic on board, They include the use of disposable cutlery, wooden cocktail sticks and reusable takeaway coffee cups instead of plastic ones. Indeed, plastic represents one of the main causes of marine pollution and thus cruise lines are increasingly

committed to finding alternative materials. Therefore, waste reduction policies consist of rules of conduct for both the crew and passengers of cruises. However, they also concern about investments in new reusable or biodegradable items.

A key solution for lowering the impact of daily cruise operations consists of the adoption of waste treatment systems (i.e., compactors and shredders using for different types of waste) which can reduce the amount of waste in terms of both volume and weight. These systems are also used for collecting and differentiating chemical and hazardous waste which require different treatments and disposal techniques (Barić et al., 2011). Compactors and shredders are argued to reduce up to 80-90% of the overall waste volume, thanks to the dehydration treatment.

Table 6.7. Waste treatment systems: environmental benefits.

Green strategies	Investment options	Environmental benefits								
		Materials	Energy	Water and Effluents	Biodiversity	GHG emissions	Air pollutants	Noise pollution	Effluents and Waste	Light pollution
Waste treatment systems	Waste reduction policies									
	Unsorted or separated waste compactor (Ecodyger, etc.)									
	Wet waste compactor (Converter NV, etc.)									
	Hazardous and chemical waste management									

No environmental benefits	
Low environmental benefits	
High environmental benefits	

Source: author's elaboration.

Capital costs associate with this green option are very low (around 25.000 USD) for compactors such as Ecodyger, whereas they may reach up to 170.000/200.000 USD for Converter NV. From a managerial perspective, these systems require employees for the supervision of the waste treatment operations as well as onboard storage spaces. Nonetheless, compactors may also reduce the land costs associated to waste treatment operations as they ensure the reduction of the number of calls for waste transfer and disposal.

6.3.6. Automation and digital interventions

Investment options belonging to the last green strategies' category includes both automation opportunities and innovative digital technologies (Table 6.8). Seaside automation refers

predominantly to autonomous vessels, which are equipped with innovative technologies and software for pre-established navigation. In the next future, new onboard cruise ship technologies are expected to contribute to energy efficiency and fuel consumption reduction. Among the most promising green investment option in this domain, the Valmet DNA automation system, implemented by Royal Caribbean on the MV Harmony of the Seas, includes an ICT based and integrated information management system capable to optimise the selection of the route. This technology can reduce fuel consumption and make the voyage more efficient and safer. Moreover, digital technologies can monitor and optimise the use of any electric device or source of light on board to lower energy consumption and environmental externalities.

Table 6.8. Automation and digital interventions major environmental benefits.

Green strategies	Investment options	Environmental benefits								
		Materials	Energy	Water and Effluents	Biodiversity	GHG emissions	Air pollutants	Noise pollution	Effluents and Waste	Light pollution
Automation and digital intervention	Autonomous shipping									
	New digital technologies									

No environmental benefits	
Low environmental benefits	
High environmental benefits	

Source: author's elaboration.

6.4. Cruise lines' commitment to green strategies: from theory to practice

6.4.1. Data and method

The original conceptual framework of Table 6.3 is empirically tested on multiple case studies, by examing the current adoption rate of each green investment option. In this vein, green strategies pursued by Royal Caribbean International (RCL), Norwegian Cruise Line (NCL) and Carnival Corporation (CCL) have been scrutinised in the 2015-2019 timeframe.

Data gathering was performed by using internal and external sources. Internal sources include cruise lines' sustainability reports and environmental reports (SR), corporate website (CW), corporate annual reports (CR) and official press releases (PR). Conversely, external sources include reports and documents from the Cruise Line International Association (CLIA), data reported by Carbon Disclosure Project Global (CDP), as well as external websites and online cruise blogs/forums (EW), including specialised news-press.

6.4.2. Royal Caribbean International

Research outcomes suggest that RCL pursues very ambitious green objectives which go beyond strict environmental regulations. According to the last Sustainability Report (2018), the company aims to reduce GHG emissions by 35% below 2005 levels by 2020. Because 98% of RCL's emissions are directly related to fuel consumption, one of the main objectives is to improve fuel efficiency by implementing new technologies and introducing innovative solutions in ship management. In this perspective, RCL is investing in alternative fuels and related technologies, such as biofuels, LNG, fuel cells, biomass, and shore power, as it emerges from both internal and external information sources (Appendix 6.1).

Most RCL ships are equipped with the latest and most efficient air-conditioning equipment and energy system available which are assisted with internal policies to reduce energy waste. RCL launched 2014 the Corporate Energy Program, which is an aggressive, multi-million-dollar investment to cut carbon emissions and increase fuel efficiency fleetwide. In line with this program, the company has installed hundreds of energy-saving upgrades and new technologies in existing and new ships. It estimated that it has been able to reduce the emission by 37 % from the 2005 baseline considering the whole fleet. Besides, for the same purposes, almost 500 projects have been completed across an array of disciplines including electrical, mechanical, hydrodynamic, and HVAC upgrades.

To manage and monitor these investments, an energy efficiency committee representing key functions of vessel design, operations, management and planning was formed. It evaluates, prioritises and implements energy efficiency and emission reduction initiatives which are reported to shoreside management in bi-monthly reports and energy checklists conducted by shipboard Officers.

In 2016, RCL and the Meyer Turku shipyard (Finland) announced an order of two ships that got started to the project name "Icon-class". It consists of new cruise ships equipped with fuel cell technology (supplied by ABB Group) and powered by environmentally friendly LNG, with a capacity of 5,000 passengers and a tonnage of 200,000 GT. These two ships are planned to be delivered in 2022 and 2024. The success of the project has led the company to order a third ship which is planned to be delivered in 2025.

Although the company believes that innovative shipbuilding practices can reduce corporate carbon footprint and boost energy efficiencies, it has invested in scrubbers to continue using current fuels, showing a mixed (traditional plus innovative) approached toward this

environmental issue. This allows to reduce the demand for distillate fuels and satisfy environmental regulations for the ongoing transitional phase.

Table 6.9. Environmental KPIs.

KEY PERFORMANCE INDICATORS	2019	2018	2017	2016
Greenhouse gas emissions (metric tonnes CO2e)[1]	4,834,768	4,382,880	4,234,770	4,464,126
Scope 1	4,820,278	4,369,021	4,242,239	4,446,268
Scope 2[2]	14,49	13,859	10,498	10,27
Emissions intensity in Tons of CO_{2e} per 1,000 available cabin days	$116.9		114.7	117.9
Emissions intensity in kilograms of CO_{2e} per ALB-km	0.244	0.228	0.232	0.235
Energy consumption non-renewable fuels (megawatt hours)	6,524,004	6,446,840	6,235,716	6,516,015
Energy intensity per available cruise passenger day	0.157	0.168	0.165	0.177
Emissions intensity per APCD	1.166.904	1.140.623	1.146.673	1.179.593
Total SO_x emissions (metric tonnes)	60,574	55,315	54,027	57,13
Total NO_x emissions (metric tonnes)	67,522	61,601	60,059	63,277
Total PM emissions (metric tonnes)	7,453	6,807	6,65	7,035
Solid waste-to-landfill (pounds per available cruise passenger day)	0,32	0,34	0,37	0,4
Food waste (cubic meters)	75,520.20	74,193.00		
Total waste recycled (pounds in millions)	46.9	43.7	40.3	37.42
Effluent quality for discharged process bilge water (parts per million)	1.5	1.5	1.5	1.5
Number of ships with Advanced Water Purification Systems	39	39	37	35
Total number of employees	76,708	76,708	65,682	73,343
Revenues (in millions)	$10,950.6	$9,493.8	$8,778.0	$8,496.4

[1]Emissions are calculated using The Greenhouse Gas Protocol. Scope 1 emissions include fuels used to operate RCL ships. Emissions factors can be found in their annual responses to the CDP Climate Change Information Request; [2]In 2013, RCL added offices that are leased but that they have direct control of energy management (consumption and payment) to RCL boundary based to their GHG emission consolidation method of "financial control").

Source: Authors' elaboration on RCL Sustainability Report 2019.

When it comes to waste treatment systems, RCL developed an original procedural and technical model articulated in three areas, aimed to i) "reduce", based on agreements with supply chain actors for reducing packaging materials and using more sustainable resources; ii) "reuse", participating in container return programs with vendors and establishing a standard donation database for each ship of the fleet; iii) "recycle", which involves crew members to select and store all trash that can be recycled. Besides, hazardous waste products are segregated into leak-proof containers and landed to an approved shoreside disposal facility, or, for some types of medical

waste, incinerated onboard. RCL ships package and store hazardous materials for recycling at ports with appropriate recycling facilities. Wherever possible, RCL recycles waste, such as fluorescent bulbs and batteries that would be classified as hazardous if they were landed ashore as garbage.

The green strategies of RCL have led the company to achieve important results in terms of environmental performance. Table 6.9 reports the environmental key performance indicators reported by the company over the period 2016-2018 (RCL Sustainability Report, 2018).

Although some indicators show a little rise between 2017 and 2018 (e.g., total energy consumption and emissions of SO_x and NO_x), GHGs have been constantly reduced in the investigated years. This highlights the commitment of the company to green strategies, considering the growth of voyages and passengers transported.

6.4.3. Norwegian Cruise Line

NCL is heavily committed to reducing CO_2 emissions. The company is an active partner of CLIA and joins its initiatives to reduce the rate of carbon emissions across the industry by 40% by 2030. In 2013 NCL launched the program Eco-Smart Cruising which outlines safety and environmental protection policies for preventing accidents and incidents regarding pollution of the environment, reducing the impact of operations on the environment, disposing of garbage and waste materials under national and international regulations, recycling and re-using materials and for establishing specific objectives and targets for future environmental management programs (Appendix 6.2).

In 2019 NCL announced a new partnership with JUST Goods Inc. to replace all single-use plastic water bottles on seventeen ships of its fleet. The "JUST Water" initiative consists of using 82% of renewable resources for the packaging and handling of water: it is part of the "Sail & Sustain Environmental Program" aimed at minimizing waste to landfills and reducing CO_2 emissions.

As reported in the Sustainability Report 2018, NCL has developed the Shipboard Energy Efficiency Management Plan for reducing onboard energy consumption. The plan is expected to reach improvements in voyage planning, speed optimization and air conditioning optimization as well as in the hydrodynamic capabilities of ships (e.g., by upgrading the propulsion system with more efficient propellers). For these purposes, energy management meetings are organised once every quarter.

NCL is investing in cold-ironing solutions for its fleet. However, less than 1% of the ports NCL calls currently have the requested infrastructure for connecting cruise ships to onshore electrical power grids. For this reason, the company launched in 2013 the Breakaway Plus Class of cruise

ships which are equipped with a range of innovative solutions for reducing fuel consumption and emissions, including the use of low sulphur fuel (LSF).

As several cruise itineraries belonging to the NCL's catalogue include destinations located in environmentally sensitive geographic areas (e.g., Alaska, the Baltic area, etc.), the company is expected to be compliant with stringent environmental regulations and it is also called to set good practices which go beyond precepts. In this perspective, to treat wastewater on board, NCL installed internationally compliant wastewater treatment systems on its fleet, and all ships built after 2001 have been equipped with Advanced Wastewater Purification (AWP) systems to meet the stringent environmental Baltic Standards.

In line with the result of the analysis (Appendix 6.2), NCL turns out to be particularly committed to investment options belonging to "Technical solutions for energy and environmental efficiency". This proves greener solutions cannot reduce only the negative externalities of the business, but they can be exploited by cruise lines to improve their operational efficiency.

6.4.4. Carnival Corporation

CCL and its subsidiaries are leading many efforts to improve the environmental sustainability of the business. In this perspective, each new ship is equipped with innovative technologies aiming at enhancing environmental performance, energy efficiency and sustainability approaches to cruising. As reported in the Sustainability Report, in 2018, CCL launched several initiatives for the installation of systems for the reduction of fuel consumption and related emissions, the optimization of navigation systems and the continuous improvement of periodic maintenance and cleaning of ships. These initiatives are included in the CCL's carbon footprint reduction program. Moreover, CCL has dedicated personnel to work with regulators, NGOs, and local communities to better understand the requirements of prominent stakeholders and improve its sustainable growth strategy. In this perspective, CCL is investing in a broad range of voluntary energy reduction initiatives that meet or surpass the requirements of current laws and regulations (Appendix 6.3).

As concerns investment options for alternative fuels, in 2019, CCL declared ten next-generation cruise ships on order. It is the first cruise line to be powered by LNG after the launch of two ships of its controlled company, AIDAnova (2018) and Costa Smeralda (2019). The sub-holding Costa Crociere was the first company to invest in LNG and it is currently working to develop further sustainable technologies, including among others: battery storage, fuel cells and liquefied gas from renewable energy sources.

AIDA, a Costa Crociere-controlled company, is notably committed to sustainability issues. For its itinerary planning, AIDA considers only ports where it is possible to hand over wastewater to carefully selected and certified disposal specialists. All ports called by the company must be equipped with AWWPS to treat the sewage generated by ships. To guarantee high environmental standards, AIDA also collaborates with the Testing Institute for Wastewater Technology in Aachen, developing new technical solutions for enhancing the efficiency of the entire cleaning process. AIDA Cruises signed a declaration of commitment in 2008 not to release any untreated wastewater anywhere in the Baltic Sea, unloading it rigorously only in port facilities. The company comply with the strict Baltic Marine Environment Protection Commission (Helsinki Commission – HELCOM) limit values and are working on achieving more stringent requirements in the future, e.g., in the Norwegian fjords.

In North America, CCL voluntarily follows the Resource Conservation and Recovery Act (RCRA) standards concerning the generation and storage of hazardous waste on board the vessel. The policy of the corporation strictly forbids the disposal of hazardous waste in trash containers, in greywater or blackwater systems. The company has defined a specific process for handling hazardous or special waste products which can be handed over only to qualified contractors and hazardous waste vendors who have suitable and certified facilities. Whether there are not approved recycling facilities at the destination, ships' hazardous materials are packaged and stored onboard until they can be transferred and unloaded at ports that can dispose of.

Princess Cruises, a subsidiary of CCL, has recently outfitted many of its ships with a custom-built electrical connection that automatically connects the electrical network of the cruise to the local electrical network ashore through a sophisticated system of cables. Thanks to these interventions, Princess' cruise ships use electric energy from ashore facilities in Juneau (Alaska), Seattle (Washington), Vancouver (British Columbia), San Francisco, Los Angeles, San Diego (California), New York and Halifax (Nova Scotia).

When it comes to innovative and digital solutions aimed to support the sustainable growth strategies, the sub-holding Costa Crociere launched in 2018 the program "Costa Futura", for developing innovative technologies and stimulating the internal personnel team in designing and proposing new sustainable initiatives. Moreover, in 2018 CCL opened the third Fleet Operations Centre (FOC) in Miami (USA), after the first in Hamburg (Germany, in 2015) and the second in Seattle (the USA, in 2016). The three FOCs are equipped with the most advanced ship to shore communications technologies available to support engineers, deck and engineering officers with all operations, including digital support, planning, routing and any other nautical and/or technical

operational need. The centres work 24 hours a day, providing real-time support to the ships for minimising the risk and improving operational efficiency.

Table 6.10. Environmental KPIs of CCL.

KEY PERFORMANCE INDICATORS	2016	2017	2018
GHGs and air emissions			
Direct GHG Emissions (metric tonnes CO2)	10,491,277	10,642,209	10,647,189
Ship Fuel Greenhouse Gas Emission Rate (grams CO2/ ALB-Km)	261	256	251
Total Sulfur Oxides (Sox) Emissions (metric tonnes)	98,089	99,622	98,543
Total Nitrogen Oxides (NOx) Emissions (metric tonnes)	253,532	257,665	258,410
Total Particulate Matter (PM2.5) Emissions (metric tonnes)	2,092	2,099	2,086
Ship fuel			
High Sulfur Fuel Oil (HSFO) (%)	75.80	74.00	73.30
Low Sulfur Fuel Oil (LSFO) (%)	3.00	5.40	6.10
Marine Diesel Oil/Marine Gas Oil (MDO/MGO) (%)	21.20	20.50	20.60
Liquefied Natural Gas (LNG) (%)	0.01	0.03	0.01
Wastewater and waste disposal			
Bilge Water Discharged to Sea (metric tonnes)	205,846	178,152	165,133
Grey Water Discharged to Sea (metric tonnes)	17,862,704	17,048,797	17,742,316
Black Water Discharged to Sea (metric tonnes)	7,915,258	7,775,545	7,873,151
Waste Rate (Excluding Recycling) (Kg/person-day)	2.3	2.2	2.2
Waste Recycled (%)	26.5	28.0	30.1
Total number of ships	102	103	104
Average crew	84,600	86,000	88,000
Revenues ($ mln)	16,389	17,510	18,881

Source: Authors' elaboration on CCL's Sustainability Report 2018 and Annual Report 2018.

CCL annually publishes within the Sustainability Report the environmental performance achieved by the entire group and by individual controlled companies. Table 6.10 summarises the main environmental KPIs of CCL for the period 2016-2018. Although the significant investments carried out at the corporate level, the green performances of the group do not always reflect expected results.

Harmful air emissions have remained stable throughout the entire investigated period, whereas GHGs emissions have even increased. This may be caused by the increasing number of voyages performed by the company over the period, as evidenced by the positive trend of revenues. However, waste recycled percentage shows a constant improvement as well as the discharge to the sea of bilge water. This highlights the commitment of CCL for green strategies to waste treatment systems which are particularly relevant for preserving the marine ecosystem.

6.5. Implications and discussion

Table 6.11 provides a comparative analysis of the three case studies reported in Section 4 to discuss more in detail the green strategies currently pursued by three of the leading cruise lines worldwide.

The multiple cases analysis performed sheds light on the state of the art concerning green investments within the cruise industry. Investment options related to "Technical solutions for energy and environmental efficiency" (category 2) as well as those belonging to the category "Ship propulsion systems and alternative fuels" (category 1) seem to attract the larger attention from the sample cruise lines. Whereas green investment options included in category 2 have been already carried out by cruise lines, those included in category 1 are mainly part of ongoing R&D projects or "under evaluation". Green investments in "ballast water treatment systems" (category 3), are progressively leaving the floor to other emerging solutions, probably also because of the technical maturity achieved by cruise lines in the implementation of these devices.

Empirical outcomes also suggest that green strategies pursued by cruise lines are typically a mix of incremental (e.g., electric-diesel engine, HVAC systems, etc.) and radical innovations (e.g., integrated electric propulsion, LNG marine propulsion with the adoption of gas turbines, etc.).

Although cruise lines pursue predominantly isomorphic behaviours when developing new strategies for increasing their green attitude (see for example recent investments in LNG-propelled ships), anecdotal evidence unveils that some peculiarities emerge with regards to each of their green investment portfolios.

The findings provide useful insights for academics, practitioners, and policymakers. The paper proposes an original conceptual framework for disentangling different green investment options in the cruise industry. For the first time, green strategies are examined to jointly meet both CSR and managerial purposes, suggesting a trade-off between cruise lines' environmental, efficiency and financial performances may exist. The paper not only provides a taxonomy of available green strategies and investment options but also shed light on the main advantages and disadvantages which originate from each solution adopted by cruise lines.

Table 6.11. Green investment options: comparing cruise lines strategic behaviour.

Green strategies	Investment options	Royal Caribbean	Carnival Corporation	Norwegian Cruise Line
Ship propulsion systems and alternative fuels	Integrated Electric Propulsion (IEP)	***		***
	Diesel-electric engines	***	***	***
	Wind power	*		
	VLSFO/ULSFO		***	*
	LNG	**	***	
	Biomass/biofuel	*		
	Hydrogen power	*	*	
Technical solutions for energy and environmental efficiency	Exhaust Gas Cleaning System (scrubber)	***	***	***
	Hull air lubrification (bubble technology)	***	***	***
	Fuel saving propeller attachment		*	
	New bulbous bow (nose job, goose neck bulb)	***	*	
	Fuel Saving Technology	**	***	**
	Retrofit Heating, Ventilation and Air Conditioning (HVAC) system	***	***	*
	Electric energy efficiency systems	***	***	***
	Solar power	*		
	Cold ironing	**	***	**
Ballast water treatment systems	Advanced wastewater purification systems (AWWPS)	***	***	***
	Ballast water exchange			
	Onboard treatment		*	
Waste treatment systems	Waste reduction policies	***	***	***
	Unsorted or separated waste compactor (Ecodyger, etc.)		**	
	Wet waste compactor (Converter NV, etc.)		**	
	Hazardous and chemical waste management	***	***	***
Automation and digital intervention	Autonomous shipping		*	
	New digital technologies	**	**	

Notes: ( ) not carried out/no information available; (*) R&D and planning; (**) ongoing; (***) carried out.

Source: Authors' elaboration.

The outcomes have also practical implications. The case studies stress valuable best practices that can be applied by cruise lines aiming at improving the sustainability and efficiency of their

business. Green strategies are argued to support cruise lines in satisfying stakeholders' pressure toward sustainability issues and to gain the license to operate. Moreover, they can also enable cruise lines to differentiate their services and create value for customers. In other words, green strategies constitute an unprecedented opportunity for differentiating cruise packages and reducing waste and energy consumption, increasing revenues and optimizing cruise lines' cost structure.

Nonetheless, the pursuit of green strategic objectives imposes well informed corporate decision-making processes for selecting the most efficient and effective technological options and technical solutions. As green investment choices are the final output of a complex and articulated decision investment process, managers are suggested to include both financial evaluation criteria and comprehensive measurement/evaluation metrics to assess the environmental benefits of each potential project. Therefore, positive effects originating from alternative investment options both in terms of environmental benefits and internal resources savings (e.g. lower energy consumption, efficient material handling, waste reduction, etc.) may contribute to increasing lines' green attitude.

Finally, the paper is also expected to support policymakers and public entities involved in the cruise industry. Policymakers, indeed, may use data and information reported in the study to design and develop more exhaustive funding programs aimed at improving the sustainability of the companies operating in the industry.

6.6. Limitations and conclusion

The paper adds to the ongoing academic debate on green technological solutions in the cruise industry. It highlights the most promising green investment options for cruise lines to lower their environmental impact. Moreover, the paper provides useful insights which may support cruise managers when evaluating alternative investments for developing effective and efficient green strategies.

Given its explorative nature, the paper suffers from several inherent limitations. First, as environmental reporting in the cruise domain is currently non-mandatory and CSR disclosure is intrinsically non-compulsory, the availability, accuracy, integrity and reliability of data related to cruise lines' green investments and related environmental benefits appear extremely heterogeneous. This inevitably brings to potential bias in terms of data comparison and business case internal validity. In this perspective, further studies from academia are expected to lay the foundations for the development of well-established common practices aimed at achieving more

transparent and reliable environmental reporting in the industry. The paper stresses the need for developing a set of standard quantitative and qualitative key performance indicators capable to assess the actual commitment of cruise lines in environmental and sustainability issues. This may also prevent the adoption of "green-washing" practices in the industry, especially if these KPIs are certified by an international authoritative third party.

Besides, the empirical analysis is performed on only three cruise lines. Although the sample also includes their subsidiaries, the number of the cruise lines must be further extended to provide more consistent research outputs.

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Appendices

Appendix 6.1. Royal Caribbean: green strategies and investment options.

Green strategies	Investment options	Internal source	External source
Ship propulsion systems and alternative fuels	Integrated Electric Propulsion (IEP)	**CW** (2017)**:** installation of electric propulsion device named Azipod (produced by ABB).	**CDP:** developing and testing advanced emissions purification (AEP); installation of electric propulsion device named Azipod (produced by ABB).
	Diesel-electric engines		
	Wind power	**SR:** RCL is actively researching and assessing progress on wind power technologies.	
	VLSFO/ULSFO		
	LNG	**SR**: Since 2020, RCL has equipped 8 cruise ships with gas-turbine engines (which burn cleaner fuels and emit less air pollution) and has launched next class of ships that will be primarily powered by LNG. **CW**: RCL Icon-class of ships, set to be delivered in 2022 will be powered by LNG (and equipped with fuel cell technology).	
	Biomass/biofuel	**CW**: Actively researching and assessing progress on these propulsion technologies.	
	Hydrogen power	**CW**: Actively researching and assessing progress on fuel cells. Icon-class of ships (powered by LNG), set to be delivered in 2022.	**EW (ABB** - 2017**)**: RCL vessel will be the first to be equipped with fuel cell system to provide an energy source for a luxury cruise ship provided by ABB.
Technical solutions for energy and environmental efficiency	Exhaust Gas Cleaning System (scrubber)	**SR**: Since 2014, RCL has invested in Advanced Emission Purifications (AEP). Currently, 70% of RCL fleet is outfitted with AEP systems, all of which are closed-loop systems. AEP system removes approximately 98% of sulphur dioxides, 40-60% of total particulate matters and up to 12% of nitrogen oxides. **CW**: the installation of scrubbers allows the company to continue using current fuels and reducing the demand for distillate fuels.	**CDP**: In 2018 RCL completed the installation of AEP system on 19 ships, investing nearly nearly $25.5 million. The company has also contracted 5 new vessels equipped with scrubbers from three different shipyards. **EW (Cruise Law News** - 2019**):** RCL has installed AEP on its largest ships such as the Harmony of the Seas and the Symphony of the Seas and retrofitted on many ships in its fleet over the last several years in order to try and clean the emission of pollutants.
	Hull air lubrification (bubble technology)	**SR**: RCL launched Air Lubrication System with Quantum of the Seas in 2014. The system reduces the amount of energy needed to propel the ship by pushing out a coat of microscopic bubbles such reducing the ship's frictional resistance as it sails.	
	Fuel saving propeller attachment		
	New bulbous bow (nose job, goose neck bulb)	**SR**: new hull design and new coatings were introduced on Celebrity Solstice-class ships to reduce drag as the ship moves through the water and to limit non-indigenous marine species' ability to attach to it and be transferred to other ecosystems.	**CDP**: RCL committed to implement several underwater hydrodynamic improvements in near term dry docks such as new hull design.

Appendix 6.1 (segue)

Technical solutions for energy and environmental efficiency	Fuel Saving Technology	**CW:** Adopted energy management software on more than 40 ships allows to identify optimal balance, speed, and route and even suggests how many engines ships should use and at what times and settings to achieve top fuel efficiency.	
	Retrofit Heating, Ventilation and Air Conditioning (HVAC) system	**SR:** RCL ships are equipped with the latest and most efficient air-conditioning equipment available. **CW:** The installation of HVAC on 21 ships contribute to reduce nearly 50,000 metric tonnes of emissions.	**CDP**: RCL continues upgrading the air handling units' enthalpy wheels, selectively replacing chiller compressors, and adding improvements like 3-way valve controls in select air handling units.
	Electric energy efficiency systems	**SR**: The light bulbs on many of ships have been replaced by LED and fluorescent lighting, which saves energy by producing the same amount of light per bulb using less wattage and producing less heat that would require more energy to be cooled. **CW**: Since 2014, the Global Marine Operations team has installed hundreds of energy-saving upgrades, reducing the emissions by 37% from 2005 baseline. Among them, High-Efficiency Appliances minimize the impact of the fleet on climate change (e.g., newest icemakers need 65 % less water than the previous machines). Variable Frequency Device (VFD) reduces energy consumption in air conditioning units, engine rooms, and galley ventilation units by controlling pumps, fans, and motors so that output matches demand. AC Chiller upgrades are showing dramatic performance results with more efficient, multi-modular systems that slash a chiller's energy consumption by 30 to 50 %.	
	Solar power	**SR**: RCL is heavily committed in solar power technologies. 21,000 square feet of thin solar film are installed onboard of the MV Oasis of the Seas.	**EW** (**Bizjournals** – 2010): on the MV Oasis of the Seas, high on deck 19, out of sight from passengers, there are 21,000 square feet of thin solar film that produce "enough power to light the ship's Royal Promenade and Central Park areas".
	Cold ironing		**EW** (**Travel Weekly**): Celebrity Apex (2,910-passenger vessel) will be the first ship in Celebrity Cruises' existing fleet to use shore power.
Ballast water treatment systems	Advanced wastewater purification systems (AWWPS)	**SR**: in 2017 AWPs have been installed onboard 37 ships at a cost of more than $150 million. In the last two years the number of ships with AWPs equipment is incremented to 39 ships and in the next future (up to 2022) the whole fleet will be equipped with this technology.	
	Ballast water exchange		
	Onboard treatment	**CW** (2016): all RCL ships have a ballast water management plan on board and treat their ballast water using not only ballast water exchange methods but also onboard treatment systems. the first one involves flushing any ballast water obtained at a foreign coast and replacing it while in the open sea at least 200 nautical miles from land with a depth of at least 200 meters. The second one presses the ballast water is sent through a UV system that renders nonviable or kills any organisms that have made it through, and from there it is stored in the ballast tanks.	**EW** (**VPO Global** - 2018): RCL has chosen Optimarin Ballast System (OBS) for retrofit to three vessels. This system is a UV-based BWTS that is modular enabling easy retrofit to any vessel (OBS has so far been retrofitted to MV Independence of the Seas, MV Mariner of the Seas (up to 2018) and MV Grandeur of the Seas (2019).

Appendix 6. 1 (segue)

Waste treatment systems	Waste reduction policies	**SR**: Implementation of original Reduce-Reuse-Recycle model (see section 4.1).	**CDP**: Reduce-Reuse-Recycle model contributes to reduce the average waste-to-landfill per available passenger to less than one-half a pound per day. This result exceeds the goal set by the company in 2014 and it is far better than the average U.S. waste per person per day of 4.3 pounds.
	Unsorted or separated waste compactor (Ecodyger, etc.)		
	Wet waste compactor (Converter NV, etc.)		
	Hazardous and chemical waste management	**SR:** Hazardous waste products are segregated into leak-proof containers and landed to an approved shoreside disposal facility, or, for some types of medical waste, incinerated onboard. Up to 2019 RCL had also success installing 14 chlorine generators on 5 ships, significantly reducing the amount of chlorine that is stored onboard our ships. **CW:** RCL implemented the Green Rating System for shipboard chemicals. This system considers each ingredient in a chemical product and examines how it affects the environment, allowing to identify and remove from shipboard use, any chemical products of concern that could harm the environment. This system has not only reduced potential chemical hazards, it has improved tracking, use and storage of chemicals and increased incentives for suppliers to provide environmentally friendlier products. In 2009 RCL has enhanced Chemical Management Program by implementing controls to facilitate purchasing approvals, improve Green Rating System and comply with the Global Harmonization System.	
Automation and digital intervention	Autonomous shipping		**EW (Rivieramm):** RCL upgraded cruise ship automation, by installing Damatic XDi automation systems on its 2003-built cruise ship, Mariner of the Seas.
	New digital technologies	**CW**: RCL has a highly sophisticated software system that optimises navigation. Visible across tablets, smartphones, and monitors from deck facilities and shoreside offices, it continually updates energy data, helping the company to optimise energy efficiency. RCL also adopted predictive route optimization system, which optimises fleet's global marine operations by calculating the most energy-efficient route. It considers such factors as environmental concerns for protected sea life; weather, and how it will affect fuel consumption; whether the ship can clear both overhead and underwater obstacles; the given ship's power plant; heavy traffic on the route; as well as winds, currents and other concerns and restrictions. Optimizing route choice RCL saved more than 10,000 metric tonnes of fuel in just two years.	

Source: Authors' elaboration.

Appendix 6.2. . Norwegian Cruise Line: green strategies and investment options.

Green strategies	Investment options	Internal source	External source
Ship propulsion systems and alternative fuels	Integrated Electric Propulsion (IEP)	**CW**: Since 2013 with the ship Norwegian Breakaway, NCL has installed smaller, more streamlined and much more efficient propulsion systems than the earlier versions of Azipod.	**EW (ABB):** Norwegian Joy (operating from April 2017) is equipped with a propulsion system with two ABB Azipod XO units, which are 20% more fuel efficient than earlier versions.
	Diesel-electric engines		**EW (OFFSHORE ENERGY)**: MAN Diesel & Turbo has won (2013) the order from Meyer Werft to supply ten V48/60 type engines with diesel-electric propulsion systems for two NCL new cruise vessels (MV Norwegian Breakaway and MV Norwegian Getaway).
	Wind power		
	VLSFO/ULSFO	**CW**: The Breakaway Plus Class cruise ships (project launched in 2013) have a range of solutions for low fuel consumption, reduced emissions and overall efficient operation.	
	LNG		**EW (Travel Weekly)**: The first Leonardo-class vessel will come into service in 2022 and only ships beyond Leonardo-class could potentially be powered by LNG. The Leonardo ships are already designed, so there is no possibility that LNG can be added.
	Biomass/biofuel		
	Hydrogen power		
Technical solutions for energy and environmental efficiency	Exhaust Gas Cleaning System (scrubber)	**SR**: NCL have implemented the EGCS on its fleet to contain harmful emissions; the company estimates a reduction of sulphur oxide emissions by up to 99%. **CW:** Since April 2019, Norwegian Bliss, Norwegian Escape, Norwegian Gem, Norwegian Jade, Norwegian Jewel, Norwegian Joy, Norwegian Pearl, Norwegian Sun and Pride of America have been equipped with the EGCS.	**EW (Wärtsilä):** Since 2013, Wärtsilä has had an engine maintenance agreement with NCL. Four new NCL cruise ships are currently under construction and all will be fitted with new Wärtsilä engines and scrubber systems.
	Hull air lubrification (bubble technology)	**CW** (2015): MV Norwegian Joy has installed an air lubrication system, i.e. the Silverstream System, aimed to creates a "carpet" of tiny air bubbles along the hull to reduce drag.	**EW (The digital ship):** Norwegian Joy and Norwegian Bliss are equipped with the Silverstream System (air lubrication technology), which creates a "carpet" of tiny air bubbles along the hull to reduce drag. It also improves the performance, bringing down fuel consumption and cutting emissions. The company claims it could deliver fuel-efficiency savings of up to 5%.

Appendix 6.2 (segue)

Technical solutions for energy and environmental efficiency	Fuel saving propeller attachment		
	New bulbous bow (nose job, goose neck bulb)		
	Fuel Saving Technology		**EW (Cruise and ferry):** In 2020 the marine coating specialist Nippon Paint Marine signed a long-term supply contract with NCL to provide its A-LF-Sea hull coating for 13 cruise ships. The low-friction SPC antifouling coating (A-LF-Sea), was already used for Norwegian Epic and Norwegian Dawn. It improves fuel-saving performance, supporting the company with achieving stringent emissions targets. This hull coating system recently won the 2020 Japanese government award for Global Warming Prevention Activity because of reducing drag it results in lower fuel consumption.
	Retrofit Heating, Ventilation and Air Conditioning (HVAC) system	**SR:** NCL planned to install HVAC systems on the new cruise class Leonardo.	
	Electric energy efficiency systems	**SR:** In 2018, NCL replaced over 200 lighting instruments in all onboard guest entertainment areas of Norwegian Jewel and Norwegian Star to upgrade their energy-efficiency. Ned LEDs result in a 70% reduction in daily energy consumption and 50% reduction of heat output. **CW:** NCL's fleet is equipped with the waste heat recovery (WHR) that allows to recover the heat from the engines and use it for other purposes (e.g., for the provision of fresh wate), beyond fuel saving.	
	Solar power		
	Cold ironing	**SR**: NCL have equipped several ships with cold ironing technology; the company is also evaluating the availability of shore-power connections in cruise ports for future new builds and itinerary planning **CW**: Since 2019, Norwegian Bliss, Norwegian Epic, Norwegian Jewel, Norwegian Joy and Norwegian Star are equipped for cold ironing.	

Appendix 6.2 (segue)

Ballast water treatment systems	Advanced wastewater purification systems (AWWPS)	**SR**: The whole fleet of NCL ships are compliant with international regulation on wastewater treatment systems. Ships built after 2001 are equipped with Advanced Wastewater Purification (AWP) systems - leading technology that meets also the stringent Baltic Standards. **CW:** The wastewater of NCL's ships is tested quarterly by third parties and environmental officers also conduct weekly water quality tests to ensure the compliance with all standards.	
	Ballast water exchange		
	Onboard treatment		
Waste treatment systems	Waste reduction policies	**SR**: NCL is heavily committed in waste reduction policies as evidenced by the collaboration with Waste Management in 2010 for the development of a Live Load unloading operation. This is one of first collaboration in the sector for reducing the time of unloading waste, the costs of transport and the use of specific containers for collecting the waste in pier. **CW**: In April 2019 Oceania Cruises, a subsidiary of NCL holding, launched a partnership with Vero Water to discontinue the use of plastic water bottles on all the ships. It aims to eliminate nearly 3 million plastic bottles per year.	**EW (Cruise Maven)**: In 2019 Norwegian Encore was the first ship to adopt a new plan to reduce waste (i.e., JUST Water). NCL eliminated single-use plastic straws and water bottle onboard and at its private islands. The company is also working on eliminating little plastic shampoo and conditioner bottles.
	Unsorted or separated waste compactor (Ecodyger, etc.)		
	Wet waste compactor (Converter NV, etc.)		
	Hazardous and chemical waste management	**SR**: NCL outlines an Approved Chemical List, which catalogues every product approved for onboard use and helps identifying toxic or hazardous materials. Safety Data Sheet (SDS) is available for all ships and provides necessary information for handling, labelling, and storing chemicals and required personal protective equipment. In 2018, NCL started to install systems to generate sanitation products onboard. It reduces accidents and limits risks associated with the transportation, handling and manual mixing of chemicals.	
Automation and digital intervention	Autonomous shipping		
	New digital technologies	**SR**: NCL has developed the "Shipboard Energy Efficiency Management Plan" which focuses on improving onboard energy efficiency. It includes improving voyage planning, speed optimization, operating engines on their most economical loads, optimization of the air conditioning system and improving the hydrodynamic capabilities of ships by upgrading the propulsion system with more efficient propellers.	

Source: Authors' elaboration.

Appendix 6.3. Carnival Corporation: green strategies and investment options.

Green strategies	Investment options	Internal source	External source
Ship propulsion systems and alternative fuels	Integrated Electric Propulsion (IEP)		
	Diesel-electric engines		
	Wind power		
	VLSFO/ULSFO		
	LNG	**SR**: In 2020, the controlled company P&O Cruises UK will launch Iona as the brand's first LNG propelled ship. P&O's second LNG ship is scheduled for delivery in 2022. In 2020 Carnival Cruise Line's Mardi Gras will also debut as the first cruise ship in North America powered by LNG. It will be the largest Carnival Cruise Line ship ever constructed. The brand's second LNG ship is scheduled for delivery in 2022. Princess Cruises, another controlled company of Carnival Corporation, has two LNG ships on order with expected delivery in 2023 and 2025.	**CDP**: Carnival Corporation is pioneering the use of LNG. The company ordered 7 new ships with dual-fuel capability that can be powered by LNG at sea as well as in port, switching from marine diesel fuel to LNG. This solution provides many air emissions benefits (i.e., zero sulphur dioxide emissions, 85% reduction in nitrogen oxides, 95-100% reduction in particulate matter, 25% reduction in carbon emissions). **EW (Cruise Hive):** P&O Cruises' Iona and Carnival Cruise Line's Mardi Gras will be respectively the third and fourth of Carnival Corporation's 11 total next-generation cruises joining the fleet within 2025 that can be powered by LNG, eliminating sulphur and significantly improving overall air emissions.
	Biomass/biofuel		
	Hydrogen power		
Technical solutions for energy and environmental efficiency	Exhaust Gas Cleaning System (scrubber)	**SR**: Carnival Corporation aims to equip 74% of the fleet (i.e., more than 85 ships) with Advanced Air Quality Systems (AAQS), open loop systems which use a sea water spray for removing sulphur from engine exhaust, converting it to sulphates before returning to the ocean. **CW:** To meet the new low sulphur fuel requirements, Carnival Corporation and Princess Cruises are investing in Advanced Air Quality Systems (AAQS) technology also called Exhaust Gas Cleaning Systems (EGCS).	**CDP**: Carnival has invested over $400 million for exhaust gas cleaning technology throughout the fleet. **EW (Cruise Law News)**: Carnival Corporation has launched a public campaign with a pro-scrubber website. The company argues scrubbers, are an effective way to reduce sulfur dioxide and other pollutants.
	Hull air lubrification (bubble technology)	**SR**: Carnival has implemented new energy savings technologies called Air Lubrication System. It creates bubbles between the ship's hull and water to reduce friction and thus it increases energy efficiency and reduces emissions.	
	Fuel saving propeller attachment	**CW:** Carnival continued its 12-year agreement with Wärtsilä to maintain the highest possible levels for cruise ship diesel engine safety, efficiency and reliability.	

Appendix 6.3 (segue)

Technical solutions for energy and environmental efficiency	New bulbous bow (nose job, goose neck bulb)	**SR**: Carnival has been investing in the development of new hull design to reduce fuel and driving energy consumption. This takes multimillion-dollar investments and a multi-pronged strategy.	**CDP**: Carnival is pursuing energy efficiency by improving hull hydrodynamic efficiency through a range of underwater modifications.
	Fuel Saving Technology	**SR:** Carnival is currently investing in fuel homogenizers, which can improve combustion and reduce fuel consumption.	
	Retrofit Heating, Ventilation and Air Conditioning (HVAC) system		**EW (Knud E. Hansen):** In 2013, Carnival Cruise Line signed a contract with Knud E. Hansen and Novenco Marine & Offshore A/S for the implementation of cutting-edge HVAC retrofitting on the Victory, Triumph, Conquest and Spirit Class cruise ships, in order to improve the overall operational efficiency of their fleet.
	Electric energy efficiency systems	**SR**: Carnival Corporation has launched a carbon footprint reduction program, whose target set (i.e., -25% by 2020), has already been exceeded in 2018, reaching -27.6%.	**CDP**: Carnival Corporation has adopted the best available energy reduction technologies in new builds in order to cut the emissions. The company upgraded mechanical and electrical components to improve engine efficiency and reliability, especially LED lights and ventilation systems to enhance ship's cooling efficiency and upgrades.
	Solar power		
	Cold ironing	**SR**: In 2018 Carnival fixed the ambitious goal to install cold ironing technology on 46% of fleetwide capacity. **CW**: Princess Cruises pioneered the use of cold ironing in the cruise industry in 2001 when Juneau (Alaska) became the first city to create a shoreside power connection. By 2020, sixteen cruises of the company will be equipped with shore power technology.	**CDP:** In 2017 Carnival set cold ironing as one of the primary 2020 goals. **EW (Ship Insight)**: Currently, over 40% of the Carnival's fleet has already had cold ironing capabilities.
Ballast water treatment systems	Advanced wastewater purification systems (AWWPS)	**SR**: Carnival will reach a coverage of AWWPS on of its whole fleetwide capacity by 10% by 2020. In 2018, Carnival has already increased fleetwide capacity coverage of AWWPS by 8.6 % compared to 2014 baseline. **CW**: By 2020, 80% of Princess Cruises' fleet will be equipped with the las available innovative technology of AWWPS which employs membrane filtration and ultraviolet light.	**CDP:** Carnival's 2020 Sustainability Goals include an increase AWWPS coverage of fleet wide capacity by 10% by 2020 compared to the level of 2014.
	Ballast water exchange		
	Onboard treatment		

Appendix 6.3 (segue)

Waste treatment systems	Waste reduction policies	**SR:** Carnival manages the amount of waste material generated onboard and work with disposal companies to promote a circular economy. Moreover, the company has installed shipboard incineration to reduce the volume of waste onboard and waste landed ashore. In 2018, the food surplus of the ships was donated to the ports of call according to the policy of waste reduction pursued by Carnival. This policy has heavily reduced the volume of food waste generated. **CW**: Since 2016, Carnival launched an initiative aimed at reducing the overall use of disposable plastics, especially cutlery, take away containers and other items. The company is committed in replacing these items with biodegradable or no-disposable materials. The controlled company Princess Cruises strictly prohibited the disposal of plastic materials at sea. Over time Princess has re-designed its food, supplies purchasing and packaging requirements to cut down on the number of plastic items that are brought onboard. Plastic has been replaced by other biodegradable materials or eliminated (e.g., laundry bags have been switched from plastic to paper that can be either recycled or incinerated).	**EW (Cruise Hive)**: Carnival Carnival has already eliminated individual servings of condiments, salad dressing, cereal boxes, single packets of white sugar, decorative items (e.g., steak temperature markers, drink umbrellas and stir sticks); toothpicks are now available only on a request basis; wood coffee stirrers will be replaced with a metal alternative; plastic cups have been replaced with paper cups; cups with hot beverages are served with a cardboard lid and cold beverages do not have a lid; drinks in souvenir glasses are now served with reusable, hard plastic, dishwasher safe straws; frozen drinks and milkshakes are served with edible straws.
	Unsorted or separated waste compactor (Ecodyger, etc.)		
	Wet waste compactor (Converter NV, etc.)	**SR**: In 2018, Carnival continued to optimize its pilot program that uses equipment to digest food waste prior to discharge at sea and. In 2017, one of Carnival brands completed an assessment to promote a more sustainable shipboard food procurement, preparation, consumption and disposal method.	
	Hazardous and chemical waste management	**SR**: Carnival meets or exceeds the stringent Resource Conservation and Recovery Act (RCRA) which requires hazardous waste management from "cradle-to-grave" in a USA port. Recycling is the preferred option for disposing of hazardous waste, such as spent fluorescent bulbs and batteries. Carnival uses a Chemical Purchasing List which refers to the Chemwatch database (leading provider in chemical management), which contains standardized, easily retrievable information about each chemical, its proper handling and use, the manufacturer's ratings for health, flammability and reactivity, and minimum requirements for personal protective equipment. Princess Cruises has instituted a program to decrease the volume of hazardous waste generated. Therefore, dry cleaning machines have been removed from the fleet.	
Automation and digital intervention	Autonomous shipping		
	New digital technologies		

Source: Authors' elaboration.

CHAPTER 7

CONCLUDING REMARKS AND FUTURE RESEARCH AGENDA

7. Concluding Remarks and Future Research Agenda

7.1. Concluding overview of the PhD thesis

This PhD thesis deals with stakeholder management in maritime logistics ecosystems. The variety of the prominent actors involved in this industry, as well as the wide number of stakeholders, the specificities of the maritime logistics cluster, and the increasing importance of both formal and informal relationships among partners and parties belonging to business networks for the survival and competitiveness of firms and organisations, make these complex business ecosystems an interesting domain for applying the theoretical constructs and managerial principles embedded in the stakeholder management perspective. Indeed, the success of maritime logistics firms and public/hybrid organisations is increasingly being determined by the way they manage relationships with business parties as well as coordinate activities, tasks, and interactions with the different categories of stakeholders belonging to the maritime logistics ecosystem. In this perspective, after an extensive review of the academic literature in port and maritime domain, three main groups of actors embedded in modern maritime logistics ecosystems (i.e., "maritime cluster", "port" and "maritime city and institutions") have been identified and discussed for the manuscript.

Chapter 1, in particular, brings to light several urgent challenges for maritime logistics actors which are grouped into three categories according to prominent recent studies: environmental, social, and technological challenges. As many of the challenges stretch through the entire ecosystem, they are expected to overlap and be intertwined. The first challenge (i.e., environmental challenge), deals with climate change adaptation and mitigation, harmful emissions generated by maritime logistics activities, and new stricter environmental regulation. This matter is putting tremendous pressure on both public and private actors embedded in maritime logistics ecosystems, especially on those belonging to the maritime cluster (e.g., shipping companies), which are urged to take prompt actions for preventing environmental impacts originating from their business operations. The maritime logistics industry is also facing social challenges. Reviewed studies demonstrate the industry is affecting the quality of life of people living in maritime cities in numerous ways. Human right, health, employment, land usage, and congestion are just some of the main social concerns for maritime logistics ecosystems. The last category, i.e., technological challenges, refers to the advent of technological advancements in maritime logistics which raise issues related to investing in, managing, and coordinating the processes for introducing and diffusing innovations within key maritime logistics actors, dramatically impacting current business processes, internal resources, and organizational profiles.

Potential solutions for these three challenges are expected to originate from collaborations between the different actors of maritime logistics ecosystems. In this perspective, stakeholder management practices are argued to be extremely relevant to move toward a more cooperative ecosystem, which goes further through simple dyadic cooperation strategies, and establishes wider and more resilient networks in the long term. Besides, the challenges identify in this PhD thesis are not grouped in three stand-alone categories and overlaps may exist. This gives maritime logistics actors the possibility to address simultaneously a multitude of problems, generating synergies and benefits for the whole community in several aspects. In this context, stakeholder management practices can develop and strengthen the competitive position of all firms and public/hybrid organizations embedded in maritime logistics ecosystems because their competitiveness is increasingly dependent on the ability to manage multiple and heterogeneous relationships.

Nonetheless, academic literature has only recently addressed stakeholder management in the maritime logistics domain. This leaves several rooms for further studies and alternative empirical approaches for disentangling the benefits of stakeholder management theoretical constructs for the maritime logistics actors. Given the above, this PhD thesis provides four empirical and exploratory research (i.e., Chapter 3, Chapter 4, Chapter 5, and Chapter 6) grounding on the theoretical constructs of stakeholder management described in Chapter 2, which include the processes of stakeholder identification, evaluation, and prioritisation, the management of relationships with salient stakeholders as well as the corporate social responsibility (CSR) and its communication to meet stakeholders' expectations. Each empirical research addresses multiple challenges (i.e., environmental, social, and technological challenges). It also assumes the perspective of one different key actor of the maritime logistics ecosystem, and it investigates specific dimensions related to strategic goals, behaviours, and options for effectively managing relationships with salient stakeholders in given circumstances. This approach to the analysis of the investigated phenomenon provides useful insights in terms of commonalities and specificities in exploiting stakeholder management principles and practices by diverse typologies of maritime logistics actors. For instance, Chapter 3 investigates both social and technological challenges applying the theoretical constructs of stakeholder prioritisation and stakeholder relationship management (SRM). On the other hand, Chapter 5 addresses environmental and social challenges exploiting the concepts of CSR and CSR communication explained in Chapter 2 to disentangle the managerial opportunities and benefits for Port Managing Bodies (PMBs) arising from these practices.

The empirical qualitative and exploratory outcomes as well as the managerial implications arising from the anecdotal evidence contribute to the academic debate on stakeholder management in

maritime logistics. Although the research design presents some limitations, it intends to lay the foundations for future studies aiming at extensively answering the four main research questions set in Chapter 1 of this PhD thesis.

7.2. Research outcomes and managerial recommendations

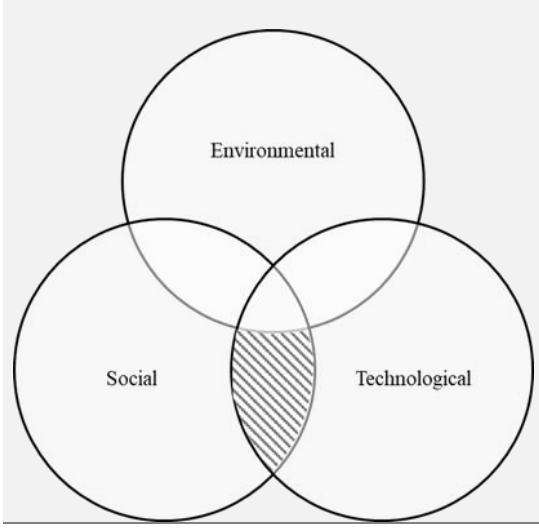
The first empirical research (Chapter 3, "The impact of innovation on dock labour: evidence from European ports") investigates both the social and technological challenges of maritime logistics ecosystems (Table 7.1). It assumes the perspective of terminal operators and their relationships with dockworkers. The study examines to what extent innovative initiatives and technological solutions adopted by terminal operators affect their business processes and relatedly also the relationships with dockworker as well as labour performance in terms of both productivity, cost efficiency, and quality. The empirical research grounds on a wider comprehensive framework which identifies three main drivers of change in the port labour domain: regulatory (institutional and normative) drivers; market drivers and technology drivers. Over the last years, these drivers have been shaping the strategic decisions of terminal operators, by imposing a review of the process of stakeholder prioritisation. Indeed, they are affecting the attributes of power, legitimacy, and urgency of salient terminal operators' stakeholders. In this context, dockworkers have become a priority for terminal operators because their performance is strongly connected with the overall performance of the terminal. Moreover, social issues (e.g., working conditions, human rights, safety at work, etc.) put an accent on the increasing attention that this group of stakeholders is crying out for.

The empirical research grounds on anecdotal evidence from North European seaports. The reason beyond of these case studies relies on the huge attention of EU port policy on port labour as demonstrated by the European institutionalised forum on social dialogue in ports set up in 2013. The outcomes of research demonstrate that the impact of discussed innovative innovations on labour performance is difficult to measure and complex in nature, particularly when focusing on the quality of labour dimension. Indeed, they may determine an increased pressure on dockworkers as well as higher risks of accidents and fatigue.

Moreover, the outcomes stress European terminal operators are currently challenged to develop additional measures to address the social challenge. In line with SRM and CSR perspectives, they cannot only focus on the hard economic aspects of innovation when trying to improve labour performance, but they should also incorporate softer social aspects in innovation processes. Indeed, European terminal operators are called to take initiatives to protect the safety and security of dockworkers that go further the EU tighter legislation. Along with a constructive and

transparent dialogue these can stimulate dockworkers' motivation, commitment, and sense of belonging to the firm. For instance, European terminal operators are expected to invest in *ad-hoc* courses for training multi-skilled dockworkers who can be able to cover diverse jobs and perform various tasks safely. These investments can enhance their labour performance thanks to an increase in labour productivity and, especially, work satisfaction (i.e., quality of labour).

Table 7.1. First empirical research: challenges and relationships investigated.

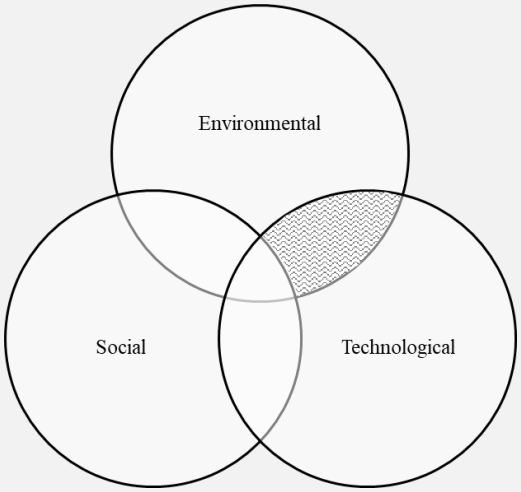
INVESTIGATED CHALLENGES	**INVESTIGATED RELATIONSHIPS**		
	*Primary perspective*	*Stakeholders*	
		Group	*Actor*
	Terminal operators (Port)	Port	**Dockworkers**

Source: Author's elaboration

The second empirical research (Chapter 4, "Digital technologies and business opportunities for logistics centres in maritime supply chains") assumes the perspective of terminal operators. It investigates their relationships with managing entities of logistics nodes embedded in the maritime supply chain, disentangling how these relationships can address environmental and technological challenges (Table 7.2).

The study stresses the importance of digital technologies for building wider networks and collaborations among the actors belonging to the same maritime logistics ecosystem. According to the theoretical constructs of SRM and, especially, the seven Principles of Stakeholder Management (Clarkson Centre, 1999), the multiple relationships of terminal operators with managing entities of maritime logistics nodes can generate valuable business opportunities in terms of increased efficiency, service differentiation, and strengthening of the strategic decision-making process.

Table 7.2. Second empirical research: challenges and relationships investigated.

INVESTIGATED CHALLENGES	**INVESTIGATED RELATIONSHIPS**		
	*Primary perspective*	*Stakeholders*	
		Group	*Actor*
	Terminal operators (Port)	Maritime cluster	**Managing entities of maritime logistics nodes;**

Source: Author's elaboration

The empirical and qualitative outcomes show technological innovations may facilitate terminal operators to listen and openly communicate with private, public and hybrid stakeholders of maritime supply chains. This fosters cooperation and ensures that business risks and harms arising from maritime logistics activities are minimized or at least appropriately shared among partners.

Moreover, the paper underlines the joint and integrated adoption of digital technologies by the managing entities of maritime logistics nodes and terminal operators that are definitively expected to make maritime supply chains more efficient, sustainable, and greener. This supports terminal operators with facing both the technological and environmental challenges of the industry. Indeed, the adoption of cooperative behaviours and the same technological solutions feed the process of co-innovation as well as mutual knowledge flows across multiple actors. The joint invention and commercialization activities appear pivotal in the modern maritime supply chain for the shared value creation that is an key element for competitiveness.

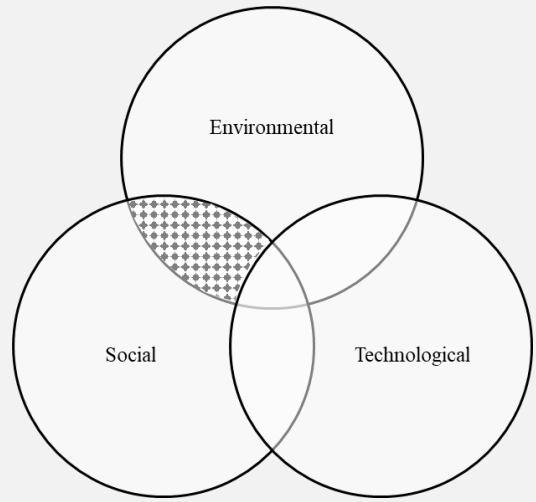
Finally, the outcomes of the empirical research demonstrate, among others, location detection technologies, big data analytics & advanced algorithms, smart sensors, and IoT platforms may reduce road gate congestions and other bottlenecks related to supply and distribution systems that are the main causes of environmental externalities. In this perspective, digital technologies provide terminal operators with support when developing smarter supply and distribution systems that have several positive ramifications in terms of environmental benefits (e.g., reduction of

queues of vehicles outside maritime logistics nodes and related harmful emissions/greenhouse gasses).

The third empirical research (Chapter 5, "Social media and CSR in ports: the case of Twitter at the port of Rotterdam") deals with social and environmental challenges (Table 7.3). Assuming the perspective of port managing bodies (PMBs), it investigates how CSR communication strategies can support PMBs when managing the relationships with diverse salient stakeholders. The study grounds on the theoretical constructs of CSR and related communication strategies providing anecdotal evidence on the adoption of social media by European PMBs. It aims to disentangle how PMBs use these marketing tools to communicate their social and environmental commitment for increasing the consensus and "license to operate" from stakeholders of coastal and maritime cities (i.e., local communities and societal groups of interest), but also actors of maritime clusters (i.e., shipping lines, transport and logistics companies, shippers) and ports (i.e., port workers and employees).

Table 7.3. Third empirical research: challenges and relationships investigated.

INVESTIGATED CHALLENGES | **INVESTIGATED RELATIONSHIPS**

<table>
<tr><td rowspan="4"> 
</td><td rowspan="2">Primary perspective</td><td colspan="2">Stakeholders</td></tr>
<tr><td>Group</td><td>Actor</td></tr>
<tr><td rowspan="3">Port Managing Bodies (Port)</td><td>Maritime cluster</td><td>Shipping lines; Transport and logistics companies; Shippers;</td></tr>
<tr><td>Port</td><td>Port workers and employees</td></tr>
<tr><td>Maritime city and institutions</td><td>Local communities; Societal groups of interests</td></tr>
</table>

Source: Author's elaboration

The empirical outcomes demonstrate that social media are widely used by the most important European PMBs and have the potential to radically change the way PMBs communicate with

their stakeholders. Over the last years, European PMBs have just demonstrated their strong commitment to sustainable and green initiatives, especially in reducing the port carbon footprint and harmful air emissions at maritime cities as well as in boosting the energy transition. However, they have often failed in correctly disseminating these initiatives, missing the opportunities to engage stakeholders. In this perspective, the research demonstrates social media appear like a valuable marketing and communication tool for PMBs to reach their salient stakeholders. Indeed, they require relatively low financial and operating costs compared to the benefits they can offer in terms of stakeholder management. Moreover, the absence of gate-keeping mechanisms enables conversations without formal hierarchies, encouraging stakeholders to interact with PMBs and reveal their interests.

In other words, social media have the potential to facilitate the building of transparent dialogue with an unlimited number of stakeholders. This supports PMBs with engaging diverse groups of actors and improving the comprehension of their specific expectations on ports' commitment to social and environmental issues. Such information is pivotal for port managers to develop CSR strategies that meet the expressed needs of target groups of stakeholders. This may also activate a virtuous process that induces PMBs to boost the quantity and quality of their social and environmental initiatives.

Although this exploratory research suffers from several limitations, its value lies in the innovativeness of the topic. Chapter 5 would lay the foundations for future studies on CSR communication strategies and social media in the port domain. The empirical and qualitative outcomes show only the tip of the iceberg, raising several stimulating research questions. In line with the theoretical constructs of CSR communication, the research calls for further studies to evaluate the effectiveness of CSR communication strategies on social media by PMBs. The reputational standing of the source (i.e., credibility), the honesty of statements, and the involvement of the recipients (i.e., port stakeholders and port users) depend on the content of the messages/posts and the typology of social media marketing tools. Therefore, the Author advocates this new stream of research in the port domain may benefit from multiple case studies analyses comparing the use of both different social media marketing tools for CSR communication by a single PMB and the same social media marketing tool by PMBs from various countries.

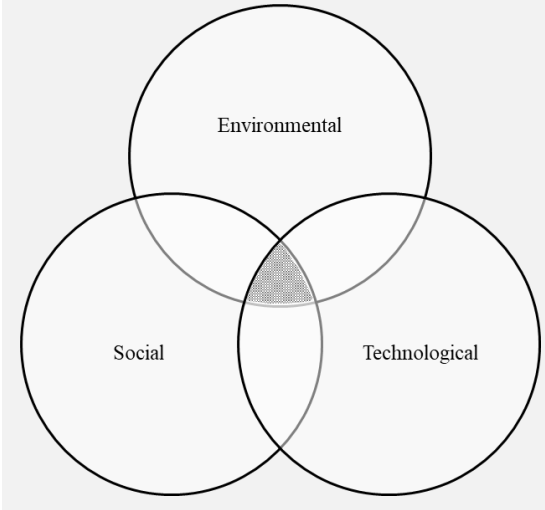
The last empirical research (Chapter 6) addresses all three main challenges for maritime logistics ecosystems (Table 7.4). It combines the SRM theories with the concepts of CSR to examine the benefits of these managerial practices for cruise lines when they introduce green innovative solutions.

According to the theoretical constructs of stakeholder identification and prioritisation, the study stresses the pivotal relationships of cruise lines with local communities of cruise port destinations as well as their customers (i.e., passengers) who has become priority stakeholders for their competitiveness. Besides, it provides some implications of green strategies for PMBs and terminal operators because most of the debated technological solutions require the involvement of these cruise lines' stakeholders for effective implementation.

The outcomes advocate green strategies can support cruise lines by reducing their environmental impacts and at the same time improving the operating efficiency of the cruise fleet. Green strategies appear also typically as a mix of incremental (e.g., electric-diesel engine, HVAC systems, etc.) and radical innovations (e.g., integrated electric propulsion, LNG marine propulsion with the adoption of gas turbines, etc.).

The anecdotal evidence on major cruise lines unveils predominantly isomorphic behaviours when cruise lines develop new strategies for increasing their green attitude (see for example the recent investments in LNG-propelled ships), even if some peculiarities emerge with regards to their green investment portfolios.

Table 7.4. Fourth empirical research: challenges and relationships investigated.

INVESTIGATED CHALLENGES	**INVESTIGATED RELATIONSHIPS**		
	*Primary perspective*	*Stakeholders*	
		Group	*Actor*
	Cruise lines (Maritime cluster)	Maritime city and institutions	**Local communities; Customers.**

Source: Author's elaboration

In line with the CSR theory, the Chapter shows green strategies are pivotal to meet the expectations of cruise lines' primary stakeholders which deal with environmental and social issues. They constitute an unprecedented opportunity to differentiate cruise services and experiences as well as to make cruise ships greener and more efficient. In this perspective, the empirical outcomes stress cruise lines should include more comprehensive criteria when taking a strategic decision: not only economic and financial profiles but also social and environmental benefits of each green investment option must be considered.

7.3. Limitations and future research agenda

The increasing importance of environmental, social, and technological issues is putting tremendous pressure on maritime logistics actors who are expected to collaborate for overtaking these challenges and building broader and more resilient networks. As widely debated in this PhD thesis, the ability to manage interactions and create partnerships with diverse stakeholders is crucial nowadays. The integration of multiple needs as well as the fair distribution of costs and benefits among parties deeply affect the survival and competitiveness of both private, public and hybrid actors of maritime logistics ecosystems. However, the variety of stakeholders and related conflicting interests require these actors to adopt different stakeholder management approaches. Moreover, SRM practices widely differ from one actor to another according to nature (i.e., private, public, or hybrid), function/role in the ecosystem, and regulatory environment. Therefore, the identification of common SRM strategies and practices in maritime logistics ecosystems is very challenging even considering the perspective of one single typology of actors.

This matter represents an important limitation of the present research, especially concerning the first two research questions of the thesis, i.e.:

I. *Who are the principal actors in maritime logistics ecosystems which make extensive use of stakeholder management practices?*
II. *Which are the main relationships of each key actor belonging to the maritime logistics ecosystems that require in-depth investigation?*

Although the generalisation of outcomes is rather hard to perform in some cases, to effectively answer these questions the Author restricts the research domain of two of the empirical chapters (i.e., Chapter 3 and 5) to a specific geographic area (i.e., Europe) for identifying communalities among investigated actors and their SRM practices. When it comes to Chapters 4 and 6, the Author extends the research worldwide, but he limits the analysis to specific relationships, i.e.:

terminal operators and managing entities of maritime logistics nodes (Chapter 4), and cruise lines and local communities/customers (Chapter 6).

Given the absence of extensive literature on stakeholder management and real applications of SRM and CSR theoretical constructs in the maritime logistics domain, these limitations are essential to circumscribe the field of investigation and carry out valuable exploratory studies. In this perspective, the present PhD thesis contributes to the international academic debate on this growing topic providing a further empirical comprehension of stakeholder management practices performed by specific actors of the investigated business ecosystem.

Nonetheless, the thesis needs to be integrated with additional in-depth studies to disentangle different perspectives and managerial aspects. To fuel the discussion, the Author also set the following third and fourth research questions:

III. *To what extent stakeholder management practices can support maritime logistics actors to tackle the three main challenges (i.e., environmental, social, and technological challenges) that the industry is experiencing?*

IV. *What are the main technological, social, and environmental benefits for maritime logistics ecosystems?*

The four empirical chapters of this manuscript apply mixed qualitative methods to answer these questions, determining an original and multifaceted approach. Considering the different challenges addressed, only a single and homogenous methodological approach would have constrained the research activity of the Author. Conversely, the thesis provides several outcomes and managerial implications that can feed different fields of research. In this perspective, multiple methodologies can be applied to integrate the empirical studies of this manuscript and fill their inherent general limitations.

First, the PhD thesis suffers from the lack of an overarching analysis that considers all the theoretical constructs of stakeholder management when investigating the single perspective of key maritime logistics actors. Indeed, it only considers the most relevant theories consistent with the type of actor as well as related stakeholders and strategic objectives. More narrow and incisive approaches are thus suggested for future studies to deepen knowledge on the managerial implications arising from the application of all theoretical constructs of stakeholder management on each type of actor. Typically, more specific argumentations provide valuable contributions to the real stakeholder management theory. Indeed, narrow approaches may allow researchers to compare the empirical outcomes, stressing multiple different opportunities for each maritime logistics actor. For instance, it would be interesting to assume the perspective of different actors of the maritime supply chain (e.g., shipping company, terminal operator, carrier, and logistics

company) and disentangle the managerial benefits and opportunities which may originate from the introduction of CSR principles within their strategic decision-making process.

Second, most of the empirical research provided by this PhD thesis deals with European case studies, which limit the validity of the outcomes. Maritime logistics is a global industry, and each ecosystem has specific characteristics in terms of market environment, governance structure, regulatory framework, cultural aspects, managerial style, number and type of actors, and level of internal competition. These differences, which refer to both the entire ecosystem and the single firm or organisation, may require further investigations by extending the sample to other regions or countries around the world. A more global view can be developed, and potential regional/national differences may emerge from a cross-cultural analysis of comparable maritime logistics ecosystems or maritime logistics actors.

Third, a longitudinal analysis of the historical evolution of relationships within a delimited maritime logistics ecosystem is lacking in the thesis. This perspective may support researchers to investigate how the relationships of one or a group of selected actors with its/their stakeholders have varied over time. Besides, it is expected to shed light on the main drivers which have triggered the interest in managing specific relationships as well as related managerial benefits and opportunities.

Fourth, the PhD thesis examines the relationships between maritime logistics actors and related stakeholders by mainly using qualitative research methods. Therefore, there is room for quantitative methods, despite the empirical quantification of the intensity of relationships is hard to perform due to the lack of available data for all the actors and stakeholders as well as the intrinsic qualitative nature of relationships.

Given the importance of stakeholder management for the competitiveness of maritime logistics ecosystems and the related key actors, the role of the academic community cannot be excluded from the global debate. Its contribution is argued to be pivotal to lead the way for building wider and more competitive networks of actors. This PhD thesis would take a step forward in the research on new managerial practices to effectively manage stakeholder relationships in the maritime logistics ecosystem. In line with the CSR principles, the Author hopes that in the next future both firms and public/hybrid organisations of the industry will take greater account of the needs of non-economic stakeholders, especially local communities of maritime cities, and the environment. It is not just about competitiveness, but rather a responsibility.