

## Reviewing the challenges of port authority business model innovation

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## Reviewing the future challenges of port authority business model innovation

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### Abstract:

The port industry is in a state of flux and port authorities are increasingly expected to create new avenues of value creation and value capture by managing multiple business models. To explore the challenges accompanying this qualitative shift in competition for port authorities, this paper presents a systematic review of port research in which four business model development challenges are analyzed, including: 1. diversification of port customers, 2. requirements for new value creation, 3. changing possibilities and constraints of value capture and 4. network effects, clusters and strategic partnerships. Based on the four challenges, it is argued that business model innovation by port authorities requires changing the underlying business logic, the activities and resources and the configurational fit with other port actors' business models. This proposition is based on a discussion on the interplay between the macro level port industry, the meso level rule structures within port systems and the micro level of port authority organizations.

**Keywords:** Port Development; Port Authority; Business Model; Business Model Innovation; Literature review;

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## 1 Introduction

The role of port authorities is in a state of flux; the awareness of the strategic role of port authorities in developing port supply chains has been growing steadily since the turn of the century; see e.g. Haezendonck et al. (2006), Van der Lugt et al. (2013) and Hollen et al. (2015). This change of roles for port authorities (Verhoeven, 2010) in connection with the heightened competition between port supply chains provides multiple avenues for rethinking the existing business models of port authorities (Kringelum, 2017).

Perspectives of strategic management is increasingly applied in studies of ports and port authorities (Woo et al., 2011; Hollen et al., 2013; van der Lugt et al., 2016). While still in its infancy, the concept of business models and business model innovation has recently been introduced in the

port research community to emphasize the intricate processes of value creation in a port system (De Martino et al., 2015; Parola et al., 2017).

A business model can be defined as representing a firm's core logic and strategic choices of value creation and capture which occur within a value network (Shafer et al., 2005). In general, the business model of port authorities has theoretically been presented as evolving along a continuum of port authority roles, from a regulatory enforcer of policies past community managers and toward entrepreneurial conveners (DeMartino et al., 2015). This implies a significant change in the business models of port authorities, a perspective currently overlooked in port development literature. In order for port authorities to develop beyond their traditional role as landlords, the value creation need to be rethought, which might require new managerial logics and practices in addition to engaging in partnerships to co-create value with stakeholders in the port. This rethinking of value creation essentially creates a platform for innovating existing port authority business models (Hollen et al., 2015). The existing activities and business model of a port authority cannot, however, be abandoned due to the threshold capabilities and resources inherent herein.

Based on this paradox of exploring future development versus exploiting the operational thresholds, the aim of the paper is to explore how current challenges emphasized in port development influence the existing and future business models of port authorities. To answer this research question, the diversity of organizational roles of port authorities is introduced in the following section. Then a systematic literature review (Jessen et al., 2011) of extant port research is presented in which current development challenges of the port industry will be synthesized by analyzing the literature through the building blocks of "the business model canvas" framework (Osterwalder and Pigneur, 2010). Based on this

synthesis, four current business model challenges of port authorities are presented including: 1. diversification of port customers, 2. requirements for new value creation, 3. changing possibilities and constraints of value capture and 4. network effects, clusters and strategic partnerships. This is followed by a general discussion on the business models of port authorities and the interplay between macro, meso and micro levels that influence the process of business model innovation. Finally, the findings of the systematic review are discussed and elaborated in terms of both future managerial challenges and research directions in port development and port authority business model innovation.

## **2 The Organizational Role of Port Authorities**

According to Verhoeven (2010: 251): “A port authority can be defined as the entity, which whether or not in conjunction with other activities, has as its objective under national law or regulation, the administration and management of the port infrastructures, and the co-ordination and control of the activities of the different operators present in the port”. This definition emphasizes the interdependence between the port authority and the private firms within and beyond the port perimeter (van der Lugt et al., 2013).

The idea of ports as spatial sites for interfirm networking that can enhance the links of companies in a supply chain through supply chain management has become widely accepted in research (Bichou and Gray, 2004; De Martino and Morvillo, 2008), as ports consist of independent yet interdependent firms (de Langen and Haezendonck, 2012). For this reason, the performance of a port is dependent on the interfirm coordination within the port. Thus, the competition between ports has shifted to one of

competition between supply chains, as the competitiveness of these influence the success of ports in general (Meersman et al., 2010).

Obtaining interfirm relationships to increase the competitiveness of a port can be challenging for port authorities due to the low degree of trust between port actors and the risk of opportunism existing within the port system (De Martino and Morvillo, 2008; De Martino et al., 2015). Nevertheless, the collective action of firms in a port system can benefit both the performance of the port as well as the competitive advantage of the firms involved. For this reason, the port authority is required to take on a new role as community or cluster manager (de Langen, 2002). The incentive for port authorities when investing in port clusters is the potential for generating revenue streams as a spillover effect (de Langen and Haezendonck, 2012); however, facilitating such clusters places a wide range of demands on the organizational capabilities of port authorities to ensure intra- and inter-organizational value creation as well as the competitiveness of the port as a whole (De Martino et al., 2015).

Traditionally, port authorities have been public companies owned by municipalities or states with a self-sustaining rather than profit-maximizing nature (de Langen and Haezendonck, 2012). However, increased competitiveness and environmental conditions have created incentives for rethinking the governance structures of ports and the role of port authorities in this regard (de Langen and van der Lugt, 2006). As evident in recent research that emphasizes the commercial role undertaken by port authorities (de Langen and van der Lugt, 2017), a need for new governance mechanisms in the port system has emerged for the organization of port authorities to ensure proactivity and a wider strategic scope (Parola et al., 2017).

If port authorities are to become more proactive and extend the strategic scope, new means of value creation and capture must flourish alongside the traditional activities of being a regulator, operator and landlord. This value creation becomes dependent on the inter-organizational relations inherent in the port system as the port authority must become a facilitator for joint strategic intent (Cahoon et al., 2013). However, doing so entails acknowledging how the business model of port authorities are affected by the business model challenges evolving in the port industry as a whole which will be explored based on the literature review presented in the following section.

### **3 Research Design and Methodology**

As aspects of strategic management are increasingly applied in port management studies (Woo et al., 2011; van der Lugt et al., 2016), a systematic literature review (Petticrew and Roberts, 2006; Jesson et al., 2011) was conducted to thematically depict the development and challenges of port authorities in existing literature. The aim of this process was to identify the underlying constructs of port authority business models presented in extant port research. The review was conducted on the five journals featuring the highest number of port research papers, according to an extensive review by Pallis et al. (2010). In addition, the newer “Journal of Research in Transportation and Business” was included due to the explicit focus on business strategy in the transportation sector of the journal. As the aim of the review was to identify existing challenges of development in port authorities, the occurrence of “port authori\*” in the abstract was the sole keyword applied. The initial search led to the identification of 131 papers; see Figure 1.

**Insert figure 1**

Based on a content analysis of the abstracts, the 131 papers were divided into separate themes; see Figure 2. The themes cover a wide range of challenges and current tendencies in port development. The role of strategy (22) in regards to competitive positioning and the governance of ports (18) are the most widely researched areas, which is in accordance with the review by Pallis et al. (2010). In conjunction with this, efficiency and productivity (14) are often emphasized by focusing on the role of operators (9) and terminal concessions (9). Furthermore, the role of ports in the infrastructure and networks (15) and the potential for public-private partnerships and cooperation (8) are recurring themes. Based on the collocation of existing themes in port research, the papers focusing explicitly on strategy, public-private partnerships and collaboration, infrastructure and network, and governance were deemed appropriate for further scrutiny to explore the current development challenges affecting the business models of port authorities.

**Insert figure 2**

To focus more in depth on the role of port authorities, a thorough review was conducted on the 63 papers covering the themes of strategy (22), governance (18), infrastructure/networks (15) and public-private partnership (PPP)/cooperation (8). The selected papers were read thoroughly and the data from the papers were tabulated to ensure scientific rigor when stating the bibliographic information, methods, perspective of port authority research and the theoretical frame applied (Petticrew and Roberts, 2006). Throughout this process, papers were excluded based on the following criteria:

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- Papers providing descriptive examples of port development focusing on the country of origin and political influence rather than on the role of the port authority
- Papers not explicitly emphasizing the port authority as an organizational entity in its own right
- Papers focusing solely on the (financial) performance of port authorities without including either exogenous or endogenous drivers
- Papers on inter-port competition
- Papers in which the full paper version was not available

In total, 34 papers were included in the final review. The 34 papers were read in depth and the data extracted from the papers were categorized in regards to their contribution in terms of the nine building blocks of the business model canvas aggregated in five sections: 1. value proposition, 2. customer segments, relations and channels 3. key activities and resources, 4. key partners, 5. cost structure and revenue streams, which when taken together represent a business model in its totality (Osterwalder and Pigneur, 2010); see appendix. This enabled a synthesis of macro level influences uncovered in existing research that have affected the development of port authority business models as four business model challenges.

The business model canvas was chosen as a framework for advancing a content analysis of the tabulated information as it is an acknowledged framework for mapping business models. The content analysis will be presented in the following and illustrated in Figure 3 to elaborate on the current challenges of business models in port authorities in existing research. In addition, the components that transcend the boundaries of the framework will be discussed as features influencing the development of



business models in port authorities, including parameters with an intra-organizational micro level focus such as managerial logic, corporate culture, vision and strategy (van der Lugt et al., 2013; Dooms and Farrell, 2017)

## **4 Development challenges for port authority business models**

Based on the content analysis of the 34 papers of the systematic review, Figure 3 illustrates how the macro level port industry business model is influenced by six parameters; internationalization of the maritime sector, increasing dependency on knowledge-based resources, agglomeration in the shipping industry, changing governance structures due to political impact, socio-economic expectations and attention to environmental influence contribute to the development challenges of port authority business models. In the following, four business model challenges will be presented by including the relevant macro level influences (marked in bold) and relating the findings to research delineating the existing business models of port authorities found in the systematic literature review.

**Insert figure 3**

### ***4.1 Diversification of port customers***

According to Osterwalder and Pigneur (2010), customers constitute the heart of any business model. The customers of port authorities are most often defined as port users (de Langen and van der Lugt, 2017). This somewhat generic label can be divided into various subgroups. The most distinct group comprises waterborne logistics companies such as shipping companies, liners and carriers, freight-forwarders and shippers (De Lombaerde and Verbeke, 1989; Brooks and Pallis, 2008; Low et al., 2009;

Woo et al., 2011; De Martino et al., 2015). Another group of customers consists of those performing activities in the supply chain such as third party service logistics organizations and terminal operators (Robinson, 2002; Brooks and Pallis, 2008; De Martino et al., 2013). In addition to those, commercial and industrial firms (De Lombaerde and Verbeke, 1989), multinational and global companies (van der Lugt et al., 2013) as well as manufacturing companies (Brooks and Pallis, 2008) can be regarded as customers for port authorities based on their dependency on the port as a logistics intermediary. Last but not least, local stakeholders that value the social utility (De Martino et al., 2013) constitute an important group to consider when developing the business model of port authorities.

In recent years, a process of **agglomeration** has influenced the shipping industry through both vertical and horizontal integration, which in turn has created fewer, yet larger and stronger, shipping companies with extensive bargaining power (Woo et al., 2011). This naturally affects the bargaining power of port authorities as the degree of dependency on a single actor increases. In general, the degree of interdependence in the port system is high as it is embedded in value-driven chain systems with a multitude of stakeholders (Robinson, 2002). For example, the relationship between a port authority and port business operators is often highlighted as it is based on creating value for customers by managing critical resources, such as knowledge and dynamic capabilities in the port system (De Martino et al., 2015).

The increasing diversification of port customers for whom the port authorities are creating value creates challenges for the management teams organizing the activities and resources within the organization as the needs of the customer groups vary considerably. In addition, the channels

through which the customers are reached and the relationships created vary significantly due to the variety and scope of value creation, which creates new requirements in regards to the relational capacity of port authorities (De Martino et al., 2015).

The diversification of port customers is thus affecting both the customers segments targeted, the relations created with new and existing customers as well as the channels through which they are addressed; see figure 3.

#### ***4.2 Requirements for new value creation***

As the number of port users and stakeholders grows considerably, so does the expectation concerning the value creation of port authorities. According to Afuah (2014), value creation occurs by managing and performing value chain activities to offer benefits for customers as a form of a perceived use value (Bowman and Ambrosini, 2000). In a port context this can be understood as the economic function to “benefit those whose trade passes through them, i.e. through providing increments to consumers' and producers' surpluses” (Goss, 1990). Traditionally, the value propositions of ports have been targeted at the final customers, such as shippers, shipping lines and freight forwarders, who choose their port of call based on a balancing of factors including location and hinterland, costs, efficiency, capacity, infrastructure, service and cooperation, to name a few (Kim, 2014; Kristiansen et al., 2016; Stevens and Vis, 2016). Port authorities must therefore adjust the activities and scope of value creation according to the various stakeholders in a value chain. This can result in the value propositions of the shipping lines shaping the value propositions of ports and port authorities (Robinson, 2002) thus reflecting business model interdependency. However, many of these parameters are interrelated with the evolving port community, the combination of companies and the relationships between companies. To create value for

### *Title*

the final customers, port authorities must consider their role in relation to the port community and the stakeholders outside the port perimeter when regarding the port as an economic cluster or business ecosystem (de Langen and van der Lugt, 2017). Essentially, the value proposition varies depending on the single customer, particularly in terms of port authorities, where it depends on the customer groups, be they societal, private manufacturing firms, operators, and so on.

The value creation potential of a port authority depends on the role adopted by the organization, which is established according to the activities undertaken by the port authority. As put forward by Verhoeven & Vanoutrive (2012: 181), the roles of port authorities can be distinguished by the following typology:

- Conservator: reactive role, maintaining focus on the regulator, operator and landlord functions
- Facilitator: mediates and manages economic and societal interest within and beyond the port community
- Entrepreneur: in addition to managing the community, commercial activities are increasingly of interest such as investing, providing services, or being a consultant not confined to the port perimeter or even national boundaries.

Essentially, the more proactive the role assumed by the port authority, the wider the scope of value creation will be.

Responding to the calls for new value creation by port authorities driven by the macro level influences creates new requirements in regards to the activities undertaken and the resources needed to execute these activities; see figure 3. Stevens and Vis (2016: 269) explored this challenge for ports that wanted to become a part of biofuel supply chains. In this case, the

activities covered the following: 1. Facilitating flows; 2. Attracting new flows; 3. Executing value-added activities of the biofuel supply chain in the port areas; 4. Developing and promoting a bio-industry cluster; and 5. Building and enacting a knowledge center. These activities stand in stark contrast to the reactive role of conservator port authorities.

To create the value expected by port customers, port authorities must increasingly supplement the traditional physical resources of the port with **knowledge-based resources** such as relational capabilities, human capital, IT infrastructure and networking to create core competencies and economies of scope (Notteboom and Winkelmanns, 2001a; De Martino et al., 2013). It is increasingly recognized that port authorities must develop absorptive capacity to stay innovative within the regional system (Cahoon et al., 2013). Hollen et al. (2015) coined this shift in port authority roles as one of becoming an ambidextrous port authority, which entails a dual focus on the exploitation of existing activities as well as the exploration of new ones. Balancing new roles and activities places new demands on the port authority as an organization as well as on its corporate culture, vision and strategy (Dooms and Farrell, 2017), which must be supported by a market-oriented managerial value and logic (van der Lugt et al., 2013).

In brief, the requirements for new value creation entails for port authorities to reconsider the fundamental value proposition offered through the business model. If port authorities are to adjust the existing value proposition or create innovation based on exploring new value propositions, they must reconfigure both the key activities and key resources of the existing business models; see figure 3.

### ***4.3 Changing possibilities and constraints of value capture***

The change of expectations in regards to value creation has prompted a change of value propositions offered to the customers by the port authority, which in turn has affected the potential for value capture. According to Robinson (2002: 241), “the port captures value for itself and for the chain in which it is embedded.” As mentioned above the more proactive the role assumed by the port authority, the wider the scope of value creation and thus potential value capture. It ranges from financial objectives of revenue generation (van der Lugt et al., 2013) to sustainability (Hollen et al., 2015), intermodal connectivity (Van den Berg et al., 2012) and regional development (Cahoon et al., 2013). In addition, port authorities are increasingly expected to become financially self-sustaining (Dooms et al., 2013). To achieve this, activities centered on exploitation and cost-efficiency have taken center-stage in the development of port authorities concurrent with the exploration of new activities to generate revenue. As a result, the possible value to be captured and the necessity of value capture is changing for port authorities.

Going back to the challenge of various customers and new requirements of value creation in port authorities, the value propositions intended for the multitude of segments create challenges in regards to managing and measuring port development. The traditional measure of cargo volume and revenue streams of port tariffs is becoming of minor interest when compared to value capture measured by regional growth for the public interest in terms of employment (van der Lugt et al., 2013) or the ability to manage and attract private ventures (Parola et al., 2017). The value capture must thus stretch between private profitability and social utility (De Martino et al., 2013; de Langen and van der Lugt, 2017) as port

authorities must increasingly manage operational, spatial and societal issues (Verhoeven, 2010). Consequently, port authorities must balance the need to capture monetary value whilst maintaining a dual focus on both **environmental** and **socio-economical value**.

In describing the complex role of port authorities, van der Lugt et al. (2013) define them as shared value hybrid organizations with both public and private characteristics. Due to this interplay of public and private roles, the cost of large investments within the port perimeter, such as intermodal solutions, are often incurred by port authorities, as private firms are reluctant to cover the losses pertaining to the years of establishment (Van den Berg et al., 2012); thus, port authorities are often experiencing an unequal division of costs in relation to the port users (Notteboom and Winkelmans, 2001b). This challenge of value capture is affected by the widely researched choice of **governance structures** in port authorities, which is dependent on the financial autonomy and governmental relations, both locally and nationally (de Langen and van der Lugt, 2006; Brooks and Pallis, 2008; Verhoeven, 2010; Verhoeven and Vanoutrive, 2012; van der Lugt et al., 2013).

Thus, if rising to the challenge of pursuing new avenues of value creation, port authorities must increasingly manage both the new possibilities of generating revenue streams but also the existing constraints of value to be captured due to existing cost structures; see figure 3.

#### ***4.4 Network effects, clusters and strategic partnerships***

The maritime sector is becoming increasingly **internationalized**, which affects the development of port authorities, as port competition intrinsically has a global scope. For this reason, inter-port collaboration, either in close proximity or across national boundaries, is becoming

widespread, which reflects new approaches to co-opetition in the sector (Dooms et al., 2013). Inter-port collaboration can, for instance, occur by establishing feeder-and-hub port relations (Low et al., 2009), which can increase connectivity and thereby potential growth.

However, port competition is no longer regarded as merely occurring between ports. Rather, the scope of competition has shifted toward competition between supply chains with the port as a central part. For this reason, the focus on strategic alliances with private firms has increased significantly, thereby creating new challenges for port management. In 1998, Suykens and Van de Voorde (1998) questioned whether it is in the interest of port authorities to encourage the formation of alliances, and to what extent port authorities should participate in alliances within the supply chain. At the time, they concluded that port authorities were rarely involved in these alliances; however, this trend has changed within the past 20 years. Port authorities are now becoming increasingly proactive in the formation and management of port clusters. The changed expectations for value creation by port authorities is affecting the role previously assumed by port authorities, as it requires them to move from an isolated position at the center of the port system to a more vulnerable position based on an increased degree of interdependence with port actors (Verhoeven, 2010).

Ports can essentially be regarded as clusters of economic activity with various degrees of agglomeration (de Langen, 2004), and the establishment of explicit port clusters is increasingly affecting the competitiveness of ports and thus port authorities (van der Lugt et al., 2013). Port authorities are increasingly acknowledging this new organizational approach within the port system. One way that port



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authorities can be an active part of such clusters is through port supply chain integration, which can be defined as:

... the extent to which a port authority plans, organizes, and coordinates activities, processes, and procedures related to physical, information, and financial flows beyond its own gates along the supply chain and monitors performance in such activities (Stevens and Vis, 2016: 262) to induce horizontal and vertical integration.

This requires the port authority to make use of the knowledge embedded in the companies within the port perimeter as well as to identify overlaps and interdependencies within and between various supply chains (De Martino and Morvillo, 2008). By doing so, port authorities can assume a leading role in establishing clusters, networks and other forms of inter-organizational collaborative arrangements (De Martino et al., 2015). However, assuming this leading role requires distinct relational capabilities and new core and threshold competencies in the organization of port authorities (De Martino and Morvillo, 2008).

Another way of organizing the supply chains within a port is for port authorities to establish port public-private partnerships (PPP). Panayides et al. (2015: 111) define port public-private partnerships as follows:

... co-operation between public and private actors with a durable character in which actors develop mutual products and/or services and in which risk, costs, and benefits are shared and mutual added value is created.

This approach to port development entails creating stronger interdependence between firms in the port, with the port authority assuming a proactive role as part of the development processes. In addition, this approach points back to the hybridization of port authorities and the challenges of balancing public and private interest within the port perimeter, that are central in regards to the **changing governance structures** founded in the political impact of ports.

Port authorities should not be regarded as isolated organizational entities. Rather, they play a significant role in the value networks spanning port perimeters. Thus, port authorities must increasingly consider the potential networks effects of new initiatives as well as the possibilities of reconfiguring the organizational boundaries by establishing port clusters and strategic partnerships; see figure 3.

## **5 Port Authority Business Models**

The review of existing challenges affecting the business models of port authorities reflects a rapidly changing competitive landscape affected by the macro level influences in the industry that impact all actors within port systems. For port authorities, this has led to an increased focus on their ability to manage a multi-sided business model (Kringelum, 2017). Multi-sided business models are often defined as digital platforms founded on the network effects of bringing together distinct yet interdependent customers, as the value of the platform diminishes if only one group of customers is present (Osterwalder and Pigneur, 2010). In the case of port authorities, the platform is the spatial setting of the port as a physical infrastructural hub. As reflected throughout the review a multi-sided business model entails facilitating an inter-model port system with various actors while managing both socio-economic and environmental needs and requirements. This means that the underlying logic and the possibilities for value creation and subsequent capture are quite diverse, depending on the various activities undertaken. Based on the insights gained through the systematic literature review, it can be argued that these varieties reflect the existence of multiple interlinked business models in port authorities. What the existence and interplay between multiple business models entails in

regards to managing an organization has until now been given low priority in business models and business model innovation research (Wirtz et al., 2016).

Traditionally, the challenge of balancing two business models has been dealt with by physically separating them into two organizations (Markides and Charitou, 2004); however, considering the interdependence and inseparability between activities and resources in port authorities, this is not a viable solution. Other approaches to be considered can be found in the ambidexterity literature, which suggests either temporal or contextual separation (Markides, 2013). In addition, creating domain ambidexterity through inter-organizational ties has been proposed as a development path for port authorities (Hollen, 2015), but striving for this kind of domain ambidexterity entails embracing the interdependence of actors within the port system and the multiple levels of analysis influencing the development process of port authorities. This entails a consideration of how macro level influences affect the meso level configurational fit between actors in the port system, which in turn constrains the development potential of the micro level business models of port authorities as elaborated in the following.

### **5.1 *Macro-meso-micro links***

For port authorities, the dependence on the actors within the port system which is inherent in the multisided business model can create challenges when changing or innovating the business model. Due to the interdependence of actors and the environment surrounding ports, a distinction between macro, meso and micro levels is relevant in future studies of ports and port authorities as reflected in figure 4. Exploring the value potential in these interdependencies requires acknowledging the interplay between existing structures and the agency of organizational

actors within the value network of the port system. This interplay is founded in the co-evolutionary perspective which has often been employed when analyzing port development (Child et al., 2013; van der Lugt et al., 2014).

The co-evolutionary view underlines the interplay between various levels of analysis and a temporal dimension of change. While studies of micro-co-evolutionary processes within a firm and macro-co-evolutionary studies of competitive pressure have been acknowledged in existing research (Lewin and Volberda, 1999), the current study on port authorities reflects a need to also consider the meso level in between. This is relevant, as the network effects underlying the business models of port authorities can constrain the process of business model innovation. Following this line of reasoning, the inter-actor configurational fit of business models at a meso level, as proposed by Storbacka et al. (2012), can be applied when exploring the different levels of analysis, which are interlinked in port value creation. Storbacka et al. (2012) argue that the meso level develops as actors use or develop the rule structures through the creation of new market practices. The emphasis on a meso level configurational fit between organizational actors is applied here to emphasize the interplay between the micro level view of the business models of port authorities as organizational actors and the meso level of value networks within the port system.

A meso level configurational fit of business models (Storbacka et al., 2012) is needed within port systems as the value creation by port authorities is intrinsically dependent on the value creation objectives of actors within the port. In addition, as presented throughout the previous review, the meso level is constrained by the macro level influences that affect the development patterns of ports as well as of port authorities.

Managing the effects of the changing competitive landscape places great responsibility on the port authorities, which, as presented throughout the review, creates a need to undertake new activities that require new resources and competencies within the port authority organization. In short, this entails that the macro level industrial challenges both posit and constrain business model development at the micro level of port authority, which must take into account the meso level configurational fit of business models within the port system as depicted in figure 4.

**Insert figure 4**

The four structural challenges of port authority business models, which were synthesized and discussed in terms of the macro level influences found in the systematic review, provide an entry point for discussing the current challenges facing port authorities in their search for competitive advantages through business model innovation. The qualitative shift in competition includes the challenge of servicing new customers as well as new stakeholders and partners while dealing with the new requirements for value creation. This change of value creation generates requirements for new activities and resources to be managed within the port authority organizations. In addition, the existing constraints and new opportunities for value capture must be acknowledged as these shape the potential for development, which is dependent on the network effect created within the port system. Changing the value creation and value capture logics as a part of business model innovation at both micro and meso levels must, however, be accompanied by micro level organizational modifications. Creating micro level business model innovation in port authorities can entail significant changes at the organizational level including the vision, strategy, corporate culture and managerial logic (van der Lugt et al., 2013; Doms and Farrell, 2017). Thus, making the managerial aspects of

business model innovation a focal point to consider both in theory and practice when discussing the future challenges of port authorities.

## **6 Discussion and concluding remarks**

The aim of this paper has been to explore challenges unfolding in the port industry that influence the business model of port authorities and essentially lead to the need for innovating the existing business model.

Based on a systematic review, four business model challenges affecting the development of port authorities were identified based on the macro level influences emphasized in the extant port literature. The four business model challenges covered the following: 1. diversification of port customers, 2. requirements for new value creation, 3. changing possibilities and constraints of value capture and 4. network effects, clusters and strategic partnerships. The qualitative shift in competition underlying these challenges has created new avenues in regards to developing and innovating the business models of port authorities as addressed in the following.

The diversification of port customers has entailed new requirements for value creation and, at the same time, created new possibilities for value capture. Nevertheless, existing constraints continue to exist, as port authorities must sustain the threshold assets and capabilities of managing an asset-heavy infrastructure. The increased diversity of customers also entails taking new stakeholders into account. To increase the competitive strength of port authorities, strategic partnerships, cluster and network management is, to a wider extent, initiated both within and beyond the port perimeter. Acknowledging these challenges as an influence in the development of port authorities and their business models is therefore

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necessary to comprehend the existing and future options of port management.

Based on these findings, it is argued that port authorities, regardless of scale and scope, are increasingly expected to manage business models as multi-sided platforms. The multi-sided platform entails managing multiple interlinked business models to affect a plethora of port users and stakeholders with various expectations and requirements regarding value creation. These requirements foster new possibilities of value capture due to the intricate links of dependence across value networks within a port system. Acknowledging the interdependence of the dual and often triple foci underlying the various business models is necessary for recognizing the challenges of business model innovation within port authority organizations. For this reason, managing the qualitative shift in competition requires, beyond the parameters discussed in regards to reconfiguring value creation, value capture and meso level configurational fit, a special focus on the micro level corporate culture (Dooms and Farrell, 2017) and managerial logic (van der Lugt et al., 2013), both of which must be suitable for the development of a market-oriented strategic intent.

### ***Future research directions***

The aim of business model innovation in port authorities is to strengthen the international competitiveness of firms in the port and the region (Van den Bosch et al., 2011). Thus far, limited research has been done on the business models of port authorities and the potential to innovate them (Hollen et al., 2013; van der Lugt et al., 2013; Hollen, 2015). To keep a dual focus on developing the business model of a port authority organization while simultaneously coordinating the value networks and

supply chains within a port system is a major task as it entails balancing various degrees of interdependence.

The interdependence of value creation within the port system generates structures that influence the development of port authorities. Taking the variety of levels of analysis into account requires making a distinction between the macro-port industry, meso-port system and micro-port authority business models, and the interplay between these. More research is needed to further elaborate this distinction and the interconnections inherent herein.

In addition to the interdependencies in the port system and the interlink of value creation, additional factors might impact the processes of business model innovation in port authorities. First, changing from an asset-based to a knowledge-based organization can be a challenging endeavor for a port authority, as it requires extending beyond the traditional business logic. This can be challenging as the financial reporting of immaterial assets, such as relational capital and investments in R&D, is often intangible and thus not acknowledged, in contrast to physical investments in the port industry. Tangible assets, such as quays, bulwarks and cranes, are crucial threshold investments with long depreciation times that are necessary for sustaining the value created by being an infrastructure provider. In contrast to this, exploration-driven investments in R&D, business development, relational capabilities and goodwill, which could provide the necessary foundation for creating competitive ports, are often deemphasized due to standardized modes of reporting. Second, the intricate links of value capture based on the choice of governance entails the need for the business models of port authorities to be regarded beyond the monetary value created and captured. This is necessary to ensure a



dual focus on the environmental and socio-economic effects and on the self-sustaining value created and captured by the organization itself.

The process of innovating the business model of port authorities is influenced and constrained by the macro level influences of the port industry, the meso level rule structure systems in port value networks, and the micro level of port authority organizations. For this reason, innovating the business model of a port authority requires changes in the underlying business logic, the activities and resources of the organization, and the configurational fit with the business models of the actors within the port system. However, more research is needed on the interplay of various levels of analysis in both port research and research on business model innovation.

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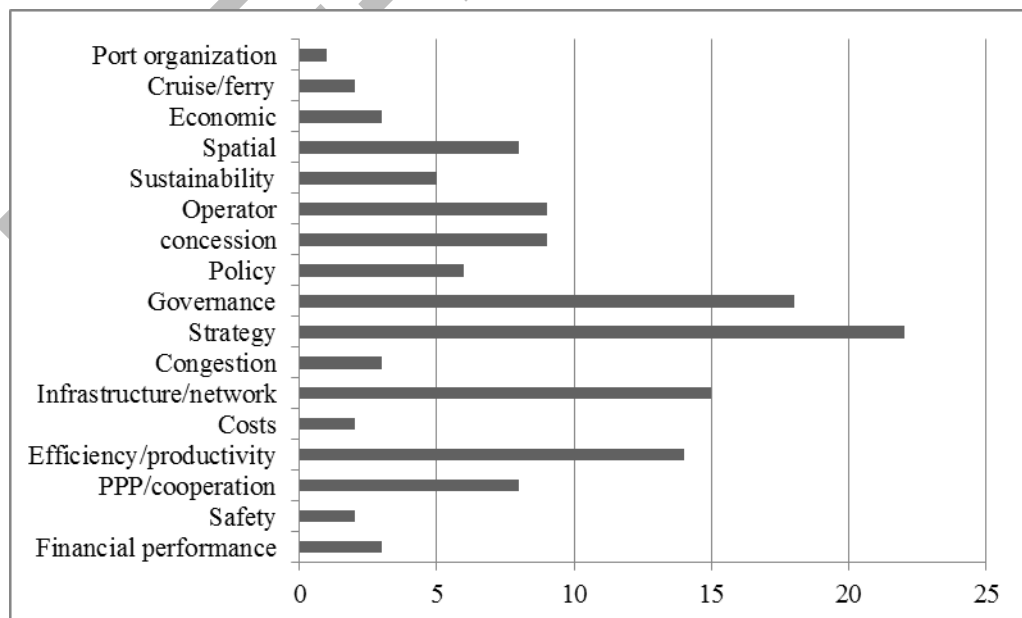
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**Figure 1: Numerical overview of systematic review**

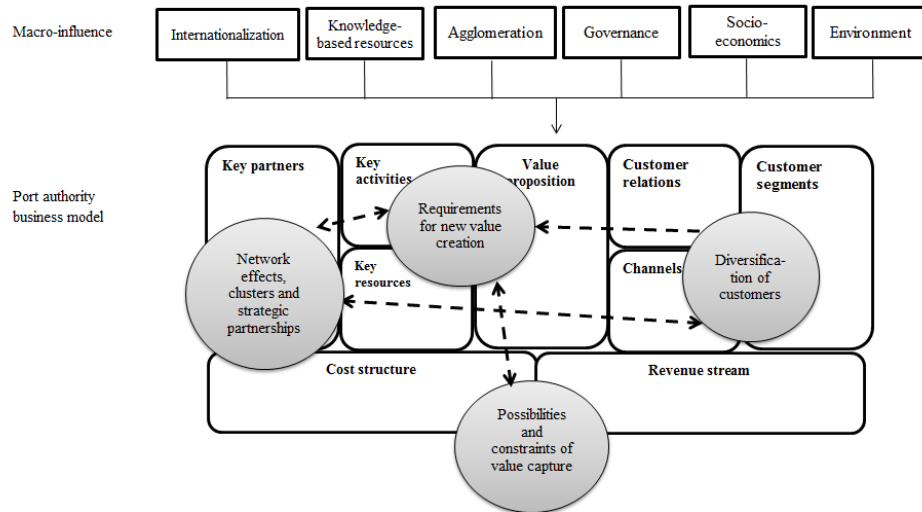
| Journal                                      | Total hits | Selected papers | Included in review |
|--|------------|-----------------|--------------------|
| International Journal of Transport Economics | 9          | 2               | 2                  |
| Journal of Transport Geography               | 14         | 5               | 3                  |
| Transportation Research (Part A)             | 12         | 3               | 2                  |
| Maritime Economics and Logistics             | 18         | 7               | 5                  |
| Maritime Policy and Management               | 55         | 27              | 13                 |
| Research in Transportation and Business      | 23         | 19              | 9                  |
| Total  | 131        | 63              | 34                 |

**Figure 2: Themes of abstracts**

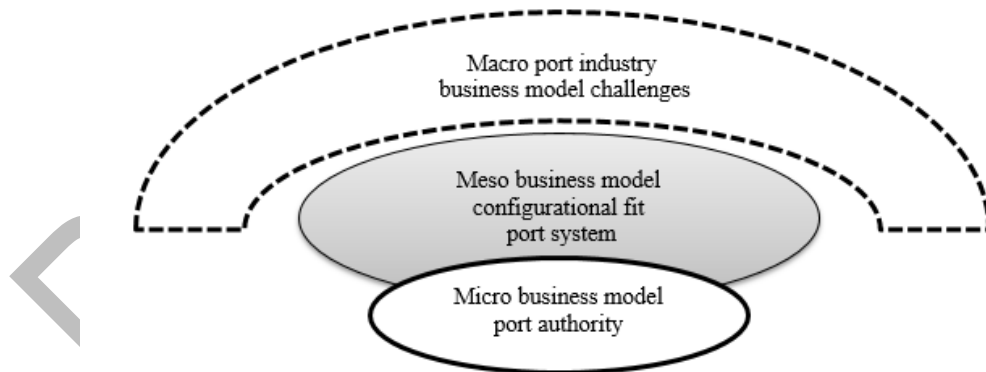


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**Figure 3: Business model challenges synthesized in the business model canvas**



**Figure 4: The macro-meso-micro link**



## Appendix

| Value proposition  | Author                                      |
|--|---|
| Hinterland/hub-feeder connections  | (Low et al. 2009)                           |
| <p><i>"...provides assets (land) and services (nautical access) to specific port users..."</i></p> <p><i>"In addition, port development includes developing connections in the port cluster, be it through open access pipelines, port community systems, utility infrastructures as well as initiatives for the collaborative utilization of these infrastructures"</i></p>   | (de Langen and van der Lugt 2017: 2)        |
| <i>"Port authorities are aiming for improved intermodal connectivity as it improves the competitive position of the port in the hinterland (Fleming &amp; Baird, 1999; Notteboom &amp; Rodrigue, 2005; Van der Horst &amp; De Langen, 2008)."</i>  | (Van den Berg et al. 2012: 98)              |
| <i>"Across governance models, port authorities, as the entities responsible for managing and developing port areas, aim to provide the most competitive environment for multinational companies (Cullinane, Teng, &amp; Wang, 2005)"</i>   | (Dooms et al. 2013: 148)                    |
| <i>"The PA is both called to defend the public interest in its own domain, and to develop the port business, by setting strategies capable of promoting, attracting, guiding and coordinating private in its own domain, and to develop the port business, by setting strategies capable of promoting, attracting, guiding and coordinating private ventures (Ircha 2001)"</i>   | (Parola et al. 2013: 135)                   |
| <i>"On the one hand PAs, as task organizations, have to defend the public interest, by favoring the creation of employment, by generating revenues from the use of public assets (i.e. port land, breakwaters, superstructures, etc.), by reducing negative externalities, by attracting foreign direct investments, etc. At the same time, PAs are growingly called to be proactive and to take initiatives through a more market-oriented and managerial logic"</i>  | (Van der Lugt, Dooms, and Parola 2013: 106) |
| <i>"In this sense the port authority's role may change for example from managing an entry or exit point into a region to being an important driver for change, having a significant impact on regional development."</i>   | (Cahoon, Pateman, and Chen 2013: 66)        |
| <i>"Important strategic goals of many port authorities are the improvement of both the competitiveness of the firms located in their port area and the overall sustainability – which includes environmental performance – of the port-related activities of these firms (Verhoeven, 2010; Van den Bosch et al, 2011; OECD, 2013; Van der Lugt et al, 2013)."</i>  | (Hollen et al. 2015: 83)                    |
| <i>"A 'conservator' port authority concentrates on being a good housekeeper and essentially sticks to a rather passive and mechanistic implementation of the three traditional port authority functions at local level. Because of this low-profile attitude, conservator port authorities may run the highest risk of becoming extinct in the future. A 'facilitator' port authority profiles itself as a mediator and matchmaker between economic and societal interests, hence the well-developed community manager function. Facilitator port authorities also look beyond the port"</i> | (Verhoeven & Vanoutrive 2012: 181)          |

# Title

|   |                                   |
|---|-----------------------------------|
| <i>perimeter and try to engage in strategic regional partnerships. It is the type of port authority, which so far seems to find most support in literature. The ‘entrepreneur’ port authority combines the main features of the facilitator with a more outspoken commercial attitude as investor, service provider and consultant on all three geographical levels (local, regional and global). Because of this ambitious profile, it is also the type that runs the highest risk of running into problems caused by conflicts between the various functional levels.”</i>  |                                   |
| <p><i>“Since ports are regarded as vital nodes in supply chains (Demirbas, Flint, and Bennett 2014), their value proposition should be targeted at serving the needs of the final customer. Specific types of needs can be distinguished for users in selecting a port. Some examples include service, costs, location, infrastructure, and timeliness (Kim 2014).”</i></p> <p><i>“We define port supply chain integration as the extent to which a port authority plans, organizes, and coordinates activities, processes, and procedures related to physical, information, and financial flows beyond its own gates along the supply chain and monitors performance in such activities (Bichou and Gray 2004; Panayides and Song 2009).”</i></p>                                    | (Stevens & Vis 2015: 262)         |
| <i>“Indeed, the port authority’s ‘value proposition’ aims to attract private investment while fostering the public utility of port for the local community and reducing the negative externalities produced by all service supply chains passing through the port.”</i>   | (De Martino et al. 2015: 683)     |
| <i>“In addition, many existing logistics actors within a port community will heavily lobby port authorities as landlords to develop and add further value by making continual physical and infrastructural changes which they believe necessary”</i>  | (McLaughlin & Fearon 2013: 281)   |
| <i>“In this context, the Port Authority covers a determining role, as it is called to identify those resources, the so called ‘critical assets’, that on different levels can promote the development of inter-organizational relationships between the various port actors and thus promote the process of adding value for the end customer.”</i>   | (De Martino & Morvillo 2008: 574) |
| <i>“At present in China, port authorities control and manage land and its use in the port area, form various ownership structures to increase private sector participation in terminal operations, allocate vessels to terminals, and prepare port development plans”</i>   | (J. & Slack 2004: 369)            |
| Operational (Ship-shore operations; Value-added logistics; industrial activities) - Spatial (Terminalisation; Port-city separation; Regionalisation) and Societal (Ecosystems; Human factor) port governance issues   | (Verhoeven 2010: 250)             |
| <p><i>“They deliver value to shippers and to third party service providers; customer segmentation and targeting is on the basis of a clearly specified value proposition; and the port captures value for itself and for the chain in which it is embedded.”</i></p> <p><i>“In effect, the port’s value proposition will be aligned with the value propositions of its shippers. In overview, then, the port: Is a third party service provider, intervening in the supply chains of individual firms; Is one element or firm among a number of firms in the import and export supply chain between producer and consumer; Will offer superior value delivery to shippers comprising markets segmented on the basis of Value Propositions aligned to the Value Proposition of</i></p> | (Robinson 2002: 241 & 250)        |



Author

|   |                                    |
|---|------------------------------------|
| <i>the port; and Will compete with other ports as a firm or entity embedded in chains or 'supply chains' focused on the port. Value delivery will be a function of the level of integration of chain systems."</i>  |                                    |
| <i>"Port authorities can play an important role in the creation of core competencies and economies of scope in the following areas: value-added logistics and logistics polarization; the development of information systems; active participation in the planning and/or implementation of new (intermodal) transport services; port networking"</i> | (Notteboom & Winkelmanns 2001: 84) |
| <i>"The economic function of a seaport is essentially 'to benefit those whose trade passes through them, i.e. through providing increments to consumers' and producers' surpluses' (Goss 1990)"</i>   | (Suykens & Voorde 1998: 252)       |

| <b>Customer segments, relations and channels</b>   | Author   |
|--|--|
| <i>"... most traffic flows are determined by private port users (shipping companies, commercial and industrial firms). These firms obviously choose the transshipping facilities which provide the best cost/service mix and will mostly not be prepared in the long run to incur additional costs resulting from loyalty to a specific port authority or transshipping company"</i>   | (De Lombaerde and Verbeke 1989: 177)           |
| <i>"Industrial practitioners and academic researchers have observed that carriers today are nimble and getting increasingly footloose in their selected ports of call."</i>  | (Low, Lam, and Tang 2009: 597)                 |
| Port users   | (de Langen and van der Lugt 2017: 2)           |
| <i>"Commercial departments of port authorities not only respond to existing customers (e.g. by jointly attracting cargo) but also increasingly promote the port area to global investors"</i><br><br><i>"... port users and clients have become multinational and even global companies over the last decades..."</i>  | (Dooms, Van der Lugt, and De Langen 2013: 148) |
| <i>"The central issue of which actor represents the proper port customer is related to the issue of who is the key actor of the port competitiveness. In particular, the Port Authority – as the super-partes actor in a Landlord model – should keep a sustainable equilibrium between private profitability (port operators as customers) and social utility (local stakeholders as customers) of the seaport."</i>  | (De Martino et al. 2013: 127)                  |
| <i>"The main challenge ports face from the structural change in logistics chains is that their main customers, the shipping lines, are becoming more powerful with stronger bargaining power, and competition between ports is getting more intense both at inter-port and intra-port levels."</i><br><br><i>"The 'Service' group is concerned with the external perspectives of performance, namely a port's relationship with its customers. Three aspects, Service Quality, Service Price and Customer-Oriented Practices were identified."</i> | (Woo et al. 2011: 257, 258)                    |

# Title

|   |                               |
|---|-------------------------------|
| Shipping companies, freight-forwarders and shippers<br><i>“In particular, the relational capacity of the port authority and port business operators is crucial to acquiring and combining critical resources (knowledge and dynamic cap-abilities) that create value for customers”</i>   | (De Martino et al. 2015: 686) |
| Often carriers are considered as the port's primary customers but can also be the manufacturer or freight forwarder or consignees.<br><i>“As a second group, there are those that are actively involved in the supply chain by providing port-related activities in wider geographical locations (i.e. operators of intermodal distribution centres, providers of port-related value-added services or value added logistics).”</i>   | (Brooks and Pallis 2008: 419) |
| <i>“Ports are elements embedded in value-driven chain systems, in value chain constellations; they deliver value to shippers and other third party service providers in the value-driven chain; they will segment their customers in terms of a value proposition; and will capture value for themselves and for the chain in which they are embedded in so doing.”</i>   | (Robinson 2002: 252)          |
| <i>“Port authorities may be interested in committing to a dedicated terminal in the interest of efficiency or to guarantee customer loyalty.”</i><br><i>However, it is a development that raises a number of important questions for port authorities: Is there, for example, a danger that a certain shipping company may monopolize (part of) the port infrastructure? Is there a risk of distortion of competition? To what extent are earlier investments by local cargo handlers affected negatively, for example by a regrouping of activities at a different terminal? Is there danger of insufficient productivity through possible overcapacity?</i> | (Heaver et al. 2000: 370)     |

| Key activities & resources  | Author                          |
|---|---------------------------------|
| Corporatization   | (de Langen & van der Lugt 2017) |
| <i>“The characteristics associated with a facilitating or entrepreneurial role are as follows. Firstly, a business-case approach needs to be adopted within the organisation, free of political interference at Board level and in executive/middle management. An entrepreneurial culture should be encouraged to emerge, coupled to strict financial discipline and sound risk management. In some ports, this has even led to the development of an R&amp;D function supporting new product/service development by private port companies and knowledge-based institutions. This requires the build-up of a strong corporate culture based on transparency, entrepreneurship and accountability, as advocated by Verhoeven (2015)</i><br><i>Secondly, in order to increase the quality of decision-making, a clear vision and strategy should be developed, moving beyond long-term infrastructure plans and endorsed by critical stakeholders. An important element is the need for increased flexibility and adaptability within the strategy, including a move away from traffic forecasting as the cornerstone of port strategy, which has led to the misallocation of funds, financial losses, and idle port capacity in the past and present (De Langen, vanMeijeren, &amp; Tavasszy, 2012).</i> | (Dooms & Farrell 2017: 136)     |

|  |  |
|--|--|
| <p>Thirdly, a permanent and constructive relationship needs to be established with stakeholders, including the business community, government agencies, and – of increasing importance – NGOs and local community interest groups. This last group of stakeholders has become crucial in providing the social acceptability that port development companies need to get the permits necessary to operate and expand port clusters (de Langen &amp; Heij, 2014; Doods, Verbeke and Haezendonck, 2013).</p> <p>Finally, the strategy of the port development company should not be confined to within the geographical boundaries of the port (Notteboom and Rodrigue, 2005). Instead, partnerships and networks need to be built beyond the port boundaries to enhance the port cluster's competitiveness (Verhoeven, 2010). This relates both to the hinterland (vander Horst &amp; van der Lugt, 2011; van den Berg &amp; de Langen, 2011), as well as the foreland (Doods, vander Lugt and de Langen, 2013). If needed, such a strategy should be underpinned by supporting investments in infrastructure (e.g. inland container platforms) and/or services (e.g. seed money for rail shuttles), as Rotterdam and Barcelona have already shown.”</p> |  |
| <p>“Intermodal transport is also a relatively sustainable way of transport (Kreutzberger, Macharis, Vereecken, &amp; Woxenius, 2003) and relieves pressure on the access highways to the port. Various players in international door-to-door chains, including port authorities, develop strategies to strengthen the intermodal network in the hinterland (Rodrigue &amp; Notteboom, 2009). However, developing new rail connections, especially in the contestable hinterland, is complex and requires substantial investments. Therefore, rail operators are reluctant to start new connections unless risks are limited.”</p>  | <p>(Van den Berg et al. 2012: 78)</p>  |
| <p>“PAs have over the years invested in the development of assets and competencies that contribute to the performance of the port. Deploying their competencies in foreign markets could provide a port authority with two benefits: additional revenue streams and an enlargement of its investment base through the opportunity of re-selling the asset or competency developed. Another motive is that a port authority increasingly has the need to further develop capabilities and resources to face the challenges in their home port. They can develop their existing capabilities or create new ones by operating in new places, either by themselves or in joint venture”</p>  | <p>(Doods et al. 2013: 150).</p>       |
| <p>“Over the years, PAs have invested in the development of assets and competencies that contribute to the performance of their port (Coeck, Notteboom, Verbeke, &amp; Winkelmanns, 1996).”</p>  | <p>(Van der Lugt et al. 2013: 109)</p> |
| <p>Within seaport, resources are those necessary to perform both transport and value-added logistics activities as they are essential to create services for different groups of costumers (De Martino &amp; Morvillo 2008) Traditionally, strategic resources in sea-ports were mainly physical and subdivided into those of public responsibility — infrastructures such as terminals, quays, inter-modal connections, etc., and those of private property — superstructures, i.e. assets for the supply of transport and logistics services such as cranes, depots, equipment, etc. However, in combination with these physical resources, the knowledge based ones – human capital, level of trust, knowledge sharing and acquisition and IT systems – are increasingly becoming source of competitiveness and innovation as these define competences hard to imitate.</p> <p>The concession of terminal, inland terminal and other logistics resources to port</p>  |  |

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|  |                                      |
|--|--------------------------------------|
| <i>operators is, as highlighted in the previous section, one of the most important tools for Port Authority to affect innovation in the seaport. Through concession policy, Port Authority can retain some control of the organization and structure of the supply side of the port market, while optimizing the use of scarce resources such as the land.</i>   | (De Martino et al. 2013: 127, 130)   |
| <i>“As an actor in a RIS, a port authority has to have absorptive capacity and be innovative. Innovation in a port’s context has particular meaning as explained by Hall and Jacobs (2010), including upgrading, consisting of process, product, functional and chain upgrading; and the mechanisms for planning, implementing, managing, and operating infrastructure systems.”</i>   | (Cahoon, Pateman, and Chen 2013: 69) |
| <i>“First, we empirically and conceptually identify how two generic policy instruments of port authorities – that is, (i) investments in physical and knowledge infrastructure and (ii) land allocation – can be turned into strategic levers to foster this development”</i>  | (Hollen et al. 2015: 81)             |
| Operational efficiency, safety & security  | (Woo et al. 2011).                   |
| <i>“In this approach, port authorities are no longer centre stage; they do play an important role in the governance of the cluster, but their role is inter-related with the activities of private firms, associations and public–private organisations. The scope of activities of the port authority has thus to be analysed in this broader framework.”</i>   | (de Langen 2004: 151)                |
| <i>“On an aggregated level, port authorities should fulfill several goals to achieve their new value proposition and perform the activities.<br/>(A) Facilitating flows; (B) Attracting new flows; (C) Executing value-added activities of the biofuel supply chain in the port area; (D) Developing and promoting a bio-industry cluster; and (E) Acting and attracting a knowledge center.”</i>  | (Stevens & Vis 2015: 269)            |
| <i>“In particular, the relational capacity of the port authority and port business operators is crucial to acquiring and combining critical resources (knowledge and dynamic cap- abilities) that create value for customers.”</i>   | (De Martino et al. 2015: 686)        |
| <i>“The activities carried out by these actors can be divided into three macro-categories [69]: (1) activities related to its foreland (maritime transport and maritime access); (2) activities within the port sector itself (such as transshipment, warehousing, value added logistics, manufacturing, forwarding and distribution); and (3) activities in relation to its hinterland (road transport, rail transport and inland navigation).”<br/><br/>“Within ports, resources are those necessary to perform both port and value-added logistics activities. These can be subdivided in [8]: infrastructures (quay, terminal etc.); superstructures (assets for supply of transport and logistics services such as cranes, depots, equipment); Human capital; Information and communication technologies systems”</i> | (De Martino & Morvillo 2008: 584)    |
| <i>“The power balance with government will influence the legal and statutory framework and the financial capability of the port authority and determine the room its management has to pursue and stimulate a pro-active culture.”</i>   | (Verhoeven 2010: 261)                |
| Maritime access ; Land and concession policy; Socio-economic negotiations; Price   | (Heaver et al. 2000:                 |

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| setting   | 368)                         |
| <i>“Jansson and Shneerson [3] propose a subdivision into seven important processes (approach and docking, unloading onto the quay, transit storage, etc.). In addition, there are other supplementary, though non-essential functions (e.g. customs, storage in the port area, cargo preparation, . . .)”</i> | (Suykens & Voorde 1998: 252) |

| Key Partners   | Author                                       |
|--|--|
| <p><i>“Port public–private partnerships (PPPs) are considered to be an important emerging mechanism for port development and improvement in port performance especially for developing countries.”</i></p> <p><i>“If from an institutional (i.e., governance and doing business factors) viewpoint the country appears weak at the eyes of (foreign) bidders, the port authority might be forced to increase the public share of engagement, because private parties are not commonly attracted by countries characterized by very unstable socio-political backgrounds and where the conditions for doing business are difficult. In this case, the port authority is driven to attract the investors by accepting a low share of private commitment. Conversely, if the port authority can rely on a strong institutional background, it may easily get the attention of many potential bidders. The competition arising among bidders is commonly expected to strengthen the role of the port authority in the negotiation and, in this case, the port authority can reasonably ask for a (much) higher degree of private commitment.”</i></p>  | (Panayides, Parola, and Lam 2015: 110 & 123) |
| <p><i>“On the other hand, the dominance of hub-and-spoke operating concept in the international shipping industry has aroused an increasing interest to justify the existence of cooperation opportunities among ports. According to Heaver (1995), port’s service networks should complement each other in a meaningful inter-port cooperation. One example is ports that share a feeder-and-hub port relationship.”</i></p> <p><i>“... (ii) offers explicit measurements of the degree of port competition and cooperation relationships (the quantification of inter-port relationships would enable port authorities to clearly identify strong potential competitors and partners).”</i></p>  | (Low, Lam, and Tang 2009: 593 & 594)         |
| <p><i>“Thirdly, a permanent and constructive relationship needs to be established with stakeholders, including the business community, government agencies, and – of increasing importance – NGOs and local community interest groups. This last group of stakeholders has become crucial in providing the social acceptability that port development companies need to get the permits necessary to operate and expand port clusters (de Langen &amp; Heij, 2014; Dooms, Verbeke and Haezendonck, 2013). Finally, the strategy of the port development company should not be confined to within the geographical boundaries of the port (Notteboom and Rodrigue, 2005). Instead, partnerships and networks need to be built beyond the port boundaries to enhance the port cluster's competitiveness (Verhoeven, 2010). This relates both to the hinterland (vander Horst &amp; van der Lugt, 2011; van den Berg &amp; de Langen, 2011), as well as the foreland (Dooms, van der Lugt and de Langen, 2013). If needed, such a strategy should be underpinned by supporting investments in infra- structure (e.g. inland container platforms) and/or services (e.g. seed money for rail shuttles), as Rotterdam and Barcelona have already shown.”</i></p> | (Dooms and Farrell 2017: 136)                |

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| <i>"In an equity partner mode, a port authority plays the role of a developer and landlord outside the home country and deploys, next to human resources, also financial resources to build, maintain, lease and sometimes operate infrastructure."</i>   | (Dooms, Van der Lugt, and De Langen 2013: 150) |
| <i>"The second strategic issue is related to the objective of strengthening the port and addresses the development of an efficient and effective port cluster. The port cluster is formed by all organizations engaging in port related activities and located in the relevant port region (De Langen, 2004). The port cluster acts in a highly competitive and rapidly changing environment. PAs aim to enhance cluster performance both in socio-economic (creation of sustainable added value and employment) and environmental terms (Dooms, Verbeke, &amp; Haezendonck, 2013). Here, the principle is that the private port sector should be involved both in financial as in managerial terms as they are leading in the port operations. PAs can influence the performance of the port cluster in various ways. They can develop an active concession policy incorporating both economic as environmental requirements (Notteboom &amp; Verhoeven, 2010). They can act as facilitators and as catalysts (Bichou &amp; Gray, 2005; Notteboom &amp; Winkelmans, 2001). They can develop activities through their role of cluster manager (De Langen, 2004), by organizing effective port marketing, market intelligence, innovation, (sustainable) hinterland access and education through own investments, by initiating partnerships or introducing incentives."</i> | (Van der Lugt et al. 2013: 107)                |
| <i>"Many port authorities tend to have close relationships with key government entities due to their governance systems. Given these close relationships, the outcomes of regional network communication driven by a port authority can be efficiently shared with governments."</i>  | (Cahoon et al. 2013: 69)                       |
| <i>"We define port supply chain integration as the extent to which a port authority plans, organizes, and coordinates activities, processes, and procedures related to physical, information, and financial flows beyond its own gates along the supply chain and monitors performance in such activities (Bichou and Gray 2004; Panayides and Song 2009)."</i><br><br><i>"Besides industry presence, cooperation between different organizations within the port is essential. A port authority can initiate, coordinate, and even orchestrate this cooperation and stimulate both horizontal and vertical integration in the port area."</i>  | (Stevens & Vis 2016: 262 & 270)                |
| <i>"Port authorities can assume an entrepreneurial role by making direct investments in the hinterland or they can play a facilitating role through the development of strategic partnerships with inland ports, dry ports and other neighbouring ports (Verhoeven 2010)."</i><br><br><i>"In the cases shown, different inter-organizational collaborative arrangements can be developed and different governance mechanisms can be implemented, ranging from more hierarchical approaches to more relational ones, most of them driven by the port authority's intervention. Port authorities can embrace concession policy as a means to promote competition between port operators, but also to enhance the collaboration and coordination of port activities through resource allocation and to create economic, relational and social connections between the port and the hinterland"</i>   | (De Martino et al. 2015: 683 & 688)            |
| <i>"Relevant port-related stakeholders exist at different levels: at the internal level of</i>  | (Verhoeven 2010:                               |

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| <p><i>the firm, and at the external level where a further distinction can be made between economic, societal and public policy stakeholders [32, 33]. The actual involvement and management of these stakeholders will vary according to whether day-to-day operations of the port, implementation of port development projects and business plans or long-term strategic planning are concerned [34]. Stakeholder management or 'cluster governance' raises the principal question about the role of the port authority, which has moved from an untouchable centre-stage position to a more vulnerable one which is inter-related with the activities of others [35]."</i></p> <p><i>"Port authorities can develop an entrepreneurial role in this respect by making direct investments in the hinterland or play a facilitating role through the development of strategic partnerships with inland ports, dry ports and co-operation or through 'co-opetition' with other, neighbouring, seaports [145–149]"</i></p> | 250 & 258)                        |
| <p><i>"Competition as an issue for port authorities is influenced by the geography of port jurisdiction. The distance between ports and their potential to serve a common hinterland affect the levels of co-operation and competition. These relationships are not static, as they are affected by ocean, port and inland costs, but they tend to persist."</i></p> <p><i>"Ports and terminals in close proximity often enter into small co-operation agreements with neighbouring facilities."</i></p>  | (Heaver et al. 2001: 296 & 300)   |
| <p><i>"The fact that the debate on port competition must increasingly be placed in the much broader context of the logistics chains also has consequences for port management. After all, one notices that, within the logistics chain, a number of strategic alliances have recently emerged. The question is, therefore, to what extent is or may a port authority be a desirable participant in this chain. Is it in port authorities' interest to encourage certain alliances?"</i></p> <p><i>"This paper has already pointed out that quite often the initiative for such alliances is taken by shipping companies. Port authorities are very rarely involved in these kinds of strategic alliances."</i></p>  | (Suykens & Voorde 1998: 259)      |
| <p><i>"In this context, the Port Authority covers a determining role, as it is called to identify those resources, the so called 'critical assets', that on different levels can promote the development of inter-organizational relationships between the various port actors and thus promote the process of adding value for the end customer."</i></p>  | (De Martino & Morvillo 2008: 574) |

| Revenue stream  | Costs   | Author                             |
|---|---|------------------------------------|
|   | <i>Investment in infrastructure such as rail and/or services</i>  | (Dooms & Farrell 2017)             |
| <p><i>"First, port authorities have an interest in hinterland access to improve port competitiveness and thus generate more port dues. (Verhoeven 2010)"</i></p> <p><i>"Apart from the direct return, new intermodal connections have important indirect benefits for port authorities,</i></p> | <p><i>"Finally it is important to stress that this case suggests that port authorities may have reasons for developing new intermodal services when private firms are reluctant to do so, even when this leads to losses in the initial years of these services. The case does not suggest it is sensible for port authorities to spend the revenues they receive from port</i></p> | (Van den Berg et al. 2012: 79, 83) |

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| including increased competitiveness and port dues, reduced congestion on the port access roads and improved knowledge on rail bottlenecks that enable better port planning and strengthen the lobby for infrastructure improvements”   | users in financially not viable intermodal connections”  |                                    |
| <p>“Such investments further regional economic growth as well contribute to market share growth of the port and financial objectives (revenue generation) of the port authority.”</p> <p>“Port authorities increasingly need to be financially self-sustaining, see e.g., the latest Spanish Port Law. As a result, port authorities increasingly focus on cost-efficiency, but also look for opportunities for generating additional income.”</p>   |  | (Dooms et al. 2013: 148, 150)      |
| <p>“Their revenue drivers are port dues paid by shipping lines, and concession fees and land rent paid by private port companies. These concession fees and land rents are agreed upon with the port companies in long term contracts (20 to 50 years is quite common), restricting the possibilities for flexible value capturing strategies (Notteboom, 2007b).”</p> <p>“Building an internationalization strategy on such developed resources and capabilities potentially expands their revenue base (Port of Rotterdam, annual report 2011), giving them a stronger financial position”</p> |  | (Dooms et al. 2013: 105, 109)      |
|  | <p>“Port authorities are rarely involved in the load centring decisions. However, many of the costs arising out of hub selection are borne by port authorities [16]. For example, ports are striving to secure adequate transfer areas and hinterland access in order to cope with possible congestion on the land leg. More than ever, the cost and benefits of load centring are not borne equally between the terminals and the shipping lines.””</p> | (Notteboom & Winkelmanns 2001: 82) |



*Author*

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|  | <i>“The total port-related cost constitutes only a fraction of the total cost associated with the logistics chain”</i> | (Suykens & Voorde 1998: 252) |
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