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# Strategic port development: identifying business opportunities for the Port of Aalborg

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## Abstract

This paper proposes a framework for strategic development of a port's collaboration with its hinterland. The framework is based on literature relevant to port development and undertakes market perspective by considering import/export data relevant for the region of interest. The series of steps proposed in the framework, provide ports with a systematic approach in finding possibilities for new business ventures and increasing integration with the hinterland. The framework is generic in its approach. A case study illustrates possible usage of the framework in terms of hinterland development.

**Keywords:** Port strategy, port development, supply chain, hinterland, integration

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## 1 Introduction

Ports play a central role in many supply chains as logistic gateways and intermodal hubs. As the importance of the connection between ports and supply chains grow stronger, the development of ports will need to have a more proactive/integrated approach to the supply chains according to Beresford et al. (2004); especially those supply chains that have relations to the ports geographical hinterland, in order to ensure the competitiveness of the entire supply chain, this is also called supply chain integration. Supply chain integration has gained much attention over the last years, but have proved difficult to implement even between few companies (Min et al., 2005). In order to start the process of integration it is necessary to look at what products should receive focus and what role should be taken to these products.

Pettit and Beresford (2009) describe different port roles in terms of demand characteristics and ports transition from gateways to logistic hubs. The role of the port depends on the type of supply chain, as well as the supply and demand characteristics. This means that the functions and facilities the port should be able to change with the supply chain type. An example of strategic port development is presented by Van den Berg and De Langen (2011) showing the case of the port of Barcelona. The reason the case of Barcelona is used is because this showcase how a port can move from gateway to supply chain integrator through a series of steps and methods.

The development of Barcelona's strategy has gone from a very port centric strategy to proactively supporting customers supply chain development. In the case Port of Barcelona the competitiveness of the supply chain is increased by integrating the hinterland and partners into the operation of the port, so the service provided by the port is tailored for its users. There is, however, still a need for a method that will

support the process of choosing the strategic direction, and namely regarding small and medium sized ports.

Actually, when going through the literature, little information is found on how ports should form their strategy. There is some literature regarding larger ports, e.g Van den Berg and De Langen's (2011) description of the Port of Barcelona development of hinterland and port system, but it is still an underdeveloped scientific area. To create a strategy for a smaller port, the literature for larger ports is used, and the concepts are rethought so they better fit into the smaller context.

Regarding smaller ports, one of the main challenges is to engage in supply chain development/integration as the complexity of these tasks is quite high. One of the main motivations for small and medium sized ports is to improve the sustainability, both in regard to the environmental footprint but also to ensure the growth of the port's hinterland, leading to economical sustainability.

The research in this paper focusses on creating a framework that can guide the process of strategic development of ports.

## 2 Literature trends

When reviewing the port literature, few concepts stand out as defining strategic methods for integrating the port to the hinterland. This section will go through some of the general tendencies of port literature and relate these to the general issue of how to develop a port. Port strategy development, regionalisation, terminalisation and port system development are the general concepts that are referred to in much of the port logistics literature and they will be introduced in the following. The literature will form the basis of a framework development.

### Port development

Port development as a research trend gained attention with the UNCTAD<sup>1</sup> commissioning an investigation of how ports have developed historically and what level of maturity the port is on regarding the different services it provides. UNCTAD commissioned a report in the 90'ies which showed that ports had been moving from a pure landlord based form of operations (not participating in the logistic operations), to a more integrated form of operations. The UNCTAD model segments ports in three different generations; which signify a stage of development. The first generation is ports that acts as landlords and gateways, and do not participate further in the supply chain. Where the third generation of ports operates as a more integrated part of the supply chain, and as an active supply chain partner. Between these generations there is a movement, which signify a development of the competencies required to become a more advanced port system.

The UNCTAD model was later followed by the WORKPORT model by Ninipoulos et al. (2000), a result of a project funded by the EU commission. The WORKPORT model was based on a research project that sought to find what impact developing technologies and other external developments have played in the development of ports. One of the WORKPORT project's conclusions was that the 3 stage generation model was too rigid to describe the real development of ports, and also that the port could have different stages of development on different areas.

Beresford et al. (2004) reviews the UNCTAD model and the WORKPORT model. They conclude that the UNCTAD model is too rigid. This is also confirmed by reality as some ports have some parts of the port system that are highly developed, and some that are very old fashioned. Further the shift from one generation to another is not done in jumps, but in a more continuous manner.

These models are the base of much of the port literature and especially the continuous development described in the WORKPORT model and the review by Beresford et al. (2004), represents the current development of port literature; and the increasing focus on a more integrated approach to port development, not only looking at the port systems but also looking at the hinterland and foreland, when deciding a strategic approach.

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<sup>1</sup> United Nations Conference on Trade and Development, <http://unctad.org/en/Pages/Home.aspx>

According to Brooks et al. (2010) small/medium sized ports need to focus on developing their coordination skills in operation and collaboration skills and in relation to other ports and companies. This can be seen as the key to convert a port from a gateway to an integrated logistics hub. (Bichou and Gray, 2004) have previously also described the concept of integrated port systems. Integrated port system is the integration of supply chain partners, in regards to cash flow, information flow and physical flow. (Bichou and Gray, 2004) also focus on the performance management (KPIs) as a tool for measuring and supplying incentive for more and better integration between actors at and around a port.

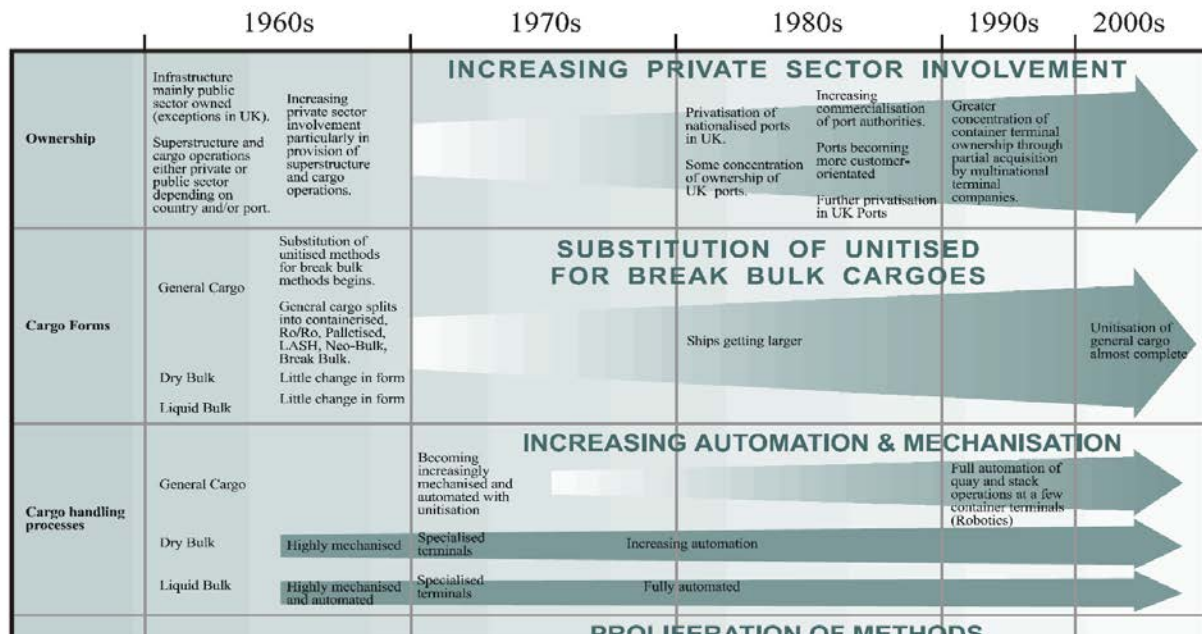


Figure 1 "WORKPORT Schematic model of the transition process in European ports" (Ninipoulos et al., 2000)

Figure 1 shows how the WORKPORT model describes the development of different areas of the ports operations. The expanding arrow shows that this area has increased focus or impact. The arrow can also be narrowing, e.g. with environmental impact, meaning that the environmental footprint becomes smaller. The interesting aspect of this model in relation to this paper is that it can be used to describe the strategy for increased involvement in the hinterland.

Most models and literature related to ports are done on the basis of cases in larger ports such as Rotterdam and Antwerp. This presents some challenges towards applying new strategies on smaller ports. There is a need for a new approach that takes into account that smaller ports needs to be more actively engaged in the development of companies supply chains, in the ports hinterland, i.e. a focus on specific products or product types to find avenues of growth. To identify which product types to focus on a method could be to investigate which products are eligible for a strategic push from a port. To do this, the concept of regionalisation is used.

## Regionalisation

Regionalisation is the process where a port develops into a defining transportation hub for an entire region, e.g. Hamburg, Rotterdam. Regionalisation does however still apply for smaller ports such as the Port of Aalborg, because it describes how to evolve the hinterland, and the functionality of the port in order to create a greater need for the products delivered by the port. Whether regionalisation also applies to single a product type e.g. windmill wings, needs to be addressed and explored. Notteboom and Rodrigue (2005) discuss some of the obstacles often present in this development, e.g. governance issues, capital raising, coordination and cooperation between partners. The Port of Barcelona has recently developed their hinterland based on regionalisation as presented by Van den Berg and De Langen (2011); resulting in

Barcelona becoming the primary logistics hub in a larger geographical area. This created a situation where the entire region have become more competitive and connected to the global trade channels.

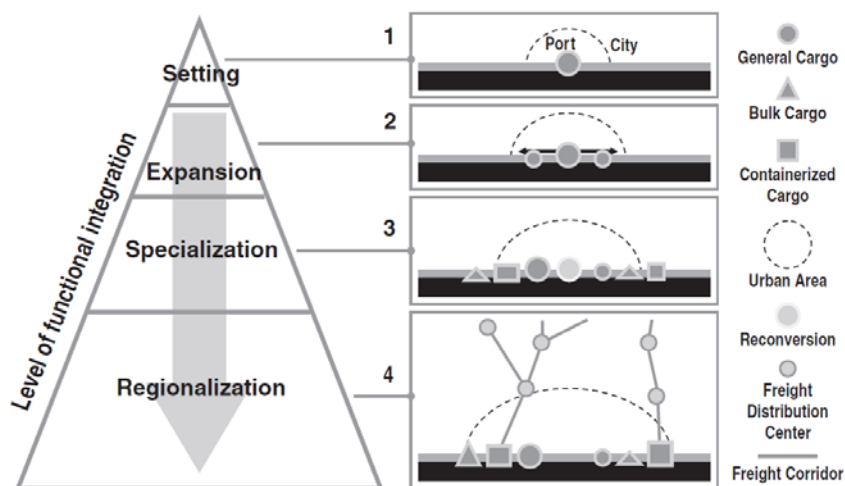


Figure 2 Regionalisation (Notteboom and Rodrigue, 2005)

Looking at Figure 2 regionalisation is defined as the gradual expansion of the geographical influence of the port. In the Port of Barcelona they increased the service level of the railway to a large region surrounding the port making it impossible for logistics operators to look past Barcelona, creating the natural attraction of cargo in the hinterland.

To scale the concepts of regionalisation to fit in small and medium sized ports, as regionalisation is seen in large ports is difficult, because of economics of scale and because smaller port will never have the same natural attraction of cargo as large ports have. Instead smaller and medium sized ports should focus on single products or product types, and form their strategy in a way that makes them a major player in a specific segment.

When a focus area is chosen based on the growth prospects, it is necessary to define the ports role in relation to this product.

## Terminalisation

In connection with integrating and developing port and hinterland, there has been increased focus on activities that could add value, when goods pass through the port. The concept of terminalisation, has been developed by Rodrigue and Notteboom (2009), by presenting two main forms of terminalisation. Bottleneck derived terminalisation is when the port is a delaying part of the supply chain, either by lack of resources or poor quality of planning and operations. The other form is warehouse derived terminalisation, which is e.g. when distribution centres are placed in a port to increase service level and decrease delivery time to the local supply chain. This should be done as opposed to sending goods further into the supply chain, i.e. many local warehouses.

The reason this adds value is because the need for stock is reduced with the number of storage locations. However, the warehouse derived terminalisation mostly applies to large continental ports. As smaller ports have access to a smaller hinterland, and therefore less economics of scale to support distribution centres on a broad sample of products, but there will often be some special cases where it may prove a vital part of keeping a supply chain competitive. Rodrigue and Notteboom (2009) also points to the shift from bottleneck to warehouse terminalisation can be seen as a change from push to pull logistics.

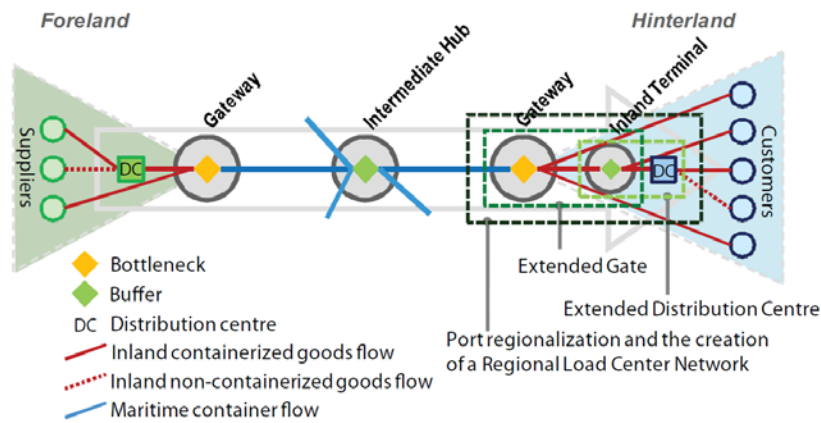


Figure 3 Terminalisation (Rodrigue and Notteboom, 2009)

Figure 3 shows how a supply chain going through a port can look. The focus in terminalisation is the distinction between buffer functionality and the bottleneck. The buffer increases the perceived service level in the downstream of the supply chain, whereas the bottleneck reduces the competitiveness of both port and supply chain.

The Port of Barcelona also employed terminalisation and the use of inland terminals to support the ports operations, and to improve the service level of the sea and rail configuration of the Barcelona region (Van den Berg and De Langen, 2011).

When the port is considering handling a certain product in the port system, it is necessary to analyse the port system in regards to that product. This should identify where to optimize and where to develop new functionality in the port system.

### Port system development

There is a trend of looking at the activities of a port more and more as a production system. One of the trends is the use of Lean and Agile as a way to make the port system more responsive towards the demand (Paixão and Marlow, 2003). Pettit and Beresford (2009) focus among other things on the demand and say that the type of demand defines which methods and concepts are relevant for the port subsystem in question. Stable/steady demand would benefit from Lean. Uncertain fast changing demand would benefit from QRM/Agile type setup. Ports also need to take a more proactive role in strategic development through market analysis and being more knowledge-based when approaching new customers (Paixão and Marlow, 2003). An example of this is also the port of Barcelona as mentioned before.

Stahlbock and Voß (2007, 2008) have done a thorough review of the different methods for scheduling and configuring the operations in the port production systems, such as terminals.

Development of the port operations is required as part of the general framework as this defines the performance of the port system and thereby the competitiveness of the port system.

In this paper this area will not be treated further, as it is outside the scope of this specific publication.

These trends together with the need for developing the business profile of the port gives a path for developing a framework for finding new business areas for a port. This framework is proposing a gradual process of analysis and selection/decision making, in order to identify which and if a certain product is candidate for strategic port development. It can also lead to a decision whether or not the chosen product is ideal for the port system in question.

## 3 Research methodology

The aim of this paper is to present a framework for strategy development in small or medium sized ports. The following methods are used to this aim:

- Literature review
  - The trends in port literature are examined and are used to create a framework that can structure the strategic development of a port in accordance with acknowledged theory. The framework will allow for relating ports' hinterland to the theory in a structured way, enabling the ports to make a strategic push into the hinterland.
- Case study
  - A case study is conducted to show how knowledge or data about a port can be used to better structure the strategic approach, the case does only cover part of the framework based on theory, and future work will include exemplifying the entire framework.

The case is based on a detailed analysis of goods moving to and from Region Nordjylland (based on export/import data from Danish Statistics). The expected result is identification of industries, and/or companies with intensive import and export profiles. The second part of the framework not explored through the case in this paper, is the analysis of the competencies and capabilities of the port, in order to identify the strengths and weaknesses of the port system.

As a result, strategic directions for a small Danish port will be identified, and give a clear understanding on what industries to focus on strategically, based on the growth potential.

#### **4 Framework for developing market strategy**

The four overall theory trends will be the backbone of a new strategy development framework for small and medium sized ports (Figure 4). The goal is to move the small and medium sized ports from a craftsman type approach on both operation and strategy, to a more industry based type. This framework is a novel method for port strategy development, and signifies a gap in the current port literature.

The suggested strategy development method will integrate the port with the hinterland by gaining more knowledge about the hinterland and a method for filtering this knowledge into manageable volumes. As the port development literature also suggests, ports will move in to a more integrated and ICT based directions, where actions and transactions are supported by a planning/execution system, (Keceli, 2011) and (Perego et al., 2011).

Regionalisation suggests focusing on developing and supporting the hinterland, drawing activities to the port from the hinterland by a clear strategic focus on the needs of the hinterland. The need of the hinterland will result in a series of requirements or wishes, which the port needs to accommodate. This leads to the concept of terminalisation, as it essential to provide the correct form of terminalisation in order to provide an attractive solution for existing and potential customers. In this paper regionalisation will be used as an overall approach for attracting and consolidating types of industry to a port.

Terminalisation focus on creating value adding and decreasing none value adding activities in the port system. Terminalisation is different from traditional the Lean concept of value adding as there is no real production in a port/terminal. Therefore there is need for a different approach to the different activities. Different needs for goods could be:

- Low lead time, distribution facilities, storage facilities, etc.

Terminalisation can be used to inquire companies and supply chains about their needs and wishes, and helping them to configure their setup at the port to fit their needs.

The framework will then focus on finding types of goods from the hinterland currently transported by other means, which can be seen as the first step of pursuing regionalisation.

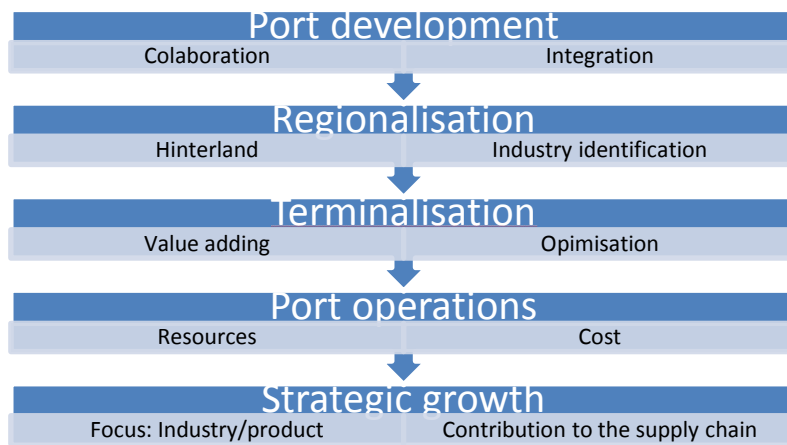


Figure 4 shows the flow through the different stages of the strategy model.

Figure 4 illustrates the concept presented in a sequential form, and illustrates what the focus of each level of the model is.

The most important factors are general measures like value, volume and weight, as these define whether or not it is optimal to transport goods through a port. These parameters are compared to how they affect other transport types, and especially high weight and high volume as these rules out e.g. air transport.

**Port development** (Chose focus area for strategy)

Define the development area with regards to the Workport model. In this paper the focus is as mentioned hinterland integration by finding new or existing customers which could be the target of a strategic push.

References UNCTAD, (Ninipoulos et al., 2000), (Beresford et al., 2004)

**Regionalisation** (To focus activities in a geographical centre)

To examine the hinterland it is necessary to use some kind of quantitative input. E.g. import/export statistics or other information that shows what is going on in the hinterland.  
This information is then used to single out types of industry and products.

References (Notteboom and Rodrigue, 2005)

**Terminalisation** (Examine the product and find out how the port should treat the product)

After the product is chosen it is necessary to consider how the port system should act towards this product. Focus on effectiveness or on value adding.

References (Rodrigue and Notteboom, 2009), (Pettit and Beresford, 2009)

**Port operations development** (Optimize on the product handling to increase competitiveness)

Port production planning and configuration. With focus on resources, capacity, planning and execution.

References (Paixão and Marlow, 2003), (Stahlbock and Voß, 2007)

These steps ensure correlation with the port literature, and thereby provide a solid framework and method for identifying new business opportunities for small/medium sized ports, building on the possibilities in the hinterland.

## 5 Case

A case study is provided to illustrate the process of finding new industry/product types for a port to use in their search for new potential customers, in relation to the regionalisation step in the framework. The choice of focusing on the hinterland development in this case is a strategic decision based on the port development, moving the port in a more modern direction in terms of its role as supply chain integrator and logistical link in the supply chain. The case therefor only provides input for a subset of the total framework.

The case is based on 1) Statistics analysis 2) Interviews 3) Theory.

The statistical data was obtained from the Danish central statistics bank, Dansk Statistik<sup>2</sup>. The data is import/export data from the northern region of Denmark, Region Nordjylland, and the data is made up of weight, volume and value of the goods going in and out. The analysis made on the data was sorted after primarily weight, as it is the data type with most complete dataset. Volume and value were also considered, but the data samples were not good enough.

1. Sort data according to Pareto law
2. Eliminate outliers
  - Data samples with erratic behaviour
3. Eliminate product groups negatively affected by the crisis
  - Reasoning: Weak growth potential
4. Identify trend and stability
  - Identify trend and stability before the crisis
  - Identify trend and stability through visual inspection
5. Identify industry types
  - The type of goods and their transport needs
6. Identify companies
  - Acquire company information
  - For interviews regarding possibilities
7. Identify origin of import and export
  - Is the transport pattern suitable for ship/train/truck (intermodal) transport?

The seven phases in the above list is how the statistical information was sorted and interpreted, in relation to the overall framework this is part of the regionalisation phase. It is then necessary to take the identified products through the other steps to align the port to the products. The data analysis ensures that the port will be left with a clearer overview of how the hinterland is configured, and what the opportunities are within the hinterland.

The model used is perhaps focusing too much on current crisis development. This can have the consequence that profitable business possibilities are lost, so in order to rule out a product type, it is necessary to establish a more statistical significant documentation for the product type. A crisis can often have a temporary effect on the demand, whereas if the same declining development has been going on since before the crisis it would be a more weighty reason.

Further the exclusion of statistical outliers is also problematic, as it can involve a lot of possible revenue. Instead the data sample should be expanded to more years and then use this to describe something about trends. And even if the data is just erratic the goods should still be examined, because if the goods represented by the outliers have a substantial value and a reasonable investment cost, it will still be an attractive investment.

The interviews conducted were mainly to find the strength and weaknesses of the port in regards to the output of the model. This is to evaluate where the port needs to invest to support the identified industry.

The result of the case study was that one industry stood out as the most prominent amongst a few other industries, and the recommendation is to develop the port system to better support this industry's needs

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<sup>2</sup> <http://www.dst.dk/>



as it is by far the biggest in terms of at least weight. It also looked as if it was the main industry in terms of volume and value, but nothing definitive about this can be said on the basis of the current dataset. The next step is to develop the potential product in terms of collaborating with the owner of the product and evaluating if potential investment needs in the port will have a reasonable return on investment.

## 6 Results and discussion

Port development is increasingly focusing on supply chain integration, where regionalisation, terminalisation and the use of industry type methods for planning and control is the main concepts in most current port literature. A strategic framework is built on these concepts in order to integrate and expand a ports connection to its hinterland.

The most prominent result of this work is the method for identifying developmental/business opportunities for a small port, by introducing a framework and leverage parameters that enable decisions support for how an optimal port role can be in a given supply chain configuration.

If comparing the general framework based on the literature and case study, there is a difference in the scope. The general framework focuses on the strategic aspect and on bringing an overview of the possibilities within different industries and products. Whereas the case study focuses on statistical analysis, which is also important, but it does not relate to all the mechanics of recent trends in port development in the same way. This leads to the result being specific and dependent on where and when the analysis is done. The general framework provides a more logistics based method, where the statistical analysis is a tool for finding possible value and growth.

Further analyses will be the basis for developing business cases that enhance the attractiveness of the Port. To do this and work on creating sustainable logistic solutions, the most prominent industries in Nordjylland are identified from the goods flow analysis.

### Implications

The possible implications are segmented into Managerial/Practical and Research implications.

#### *Managerial*

Seen from a manager's perspective in a port, this framework would provide a method for identifying possible new customers in structured step-by-step mode. In terms of strategic management, the framework makes it easier to follow a certain strategy, e.g. deciding to focus on food or IT equipment. This is because the frame asks how to handle the specific types of goods.

#### *Practical*

With the use of such a framework there will be an easier route for moving goods from truck to ship. This will have implications for environmental factors as the footprint for ship transport is lower.

Based on the case by the students, the port have also received input for their future marketing strategy, as they now have an overview of the potential in their hinterland.

#### *Research*

The research contribution of this paper is combination of the literature based concepts into a framework that enables port ↔ hinterland integration, by facilitating a marketing approach for the port.

Future work would require practical validation of the general model and adjustments for this model where practicality and other literature require it.

Future work would include a more detailed exploration of the steps of the framework. Describing in detail how each step is carried out, and exemplified with case studies.

## 7 Acknowledgement

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