

# A CASE STUDY APPROACH TO PORT CENTRIC LOGISTICS: THE SEA PORT VERSUS INLAND LOCATION DILEMMA

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## **Introduction**

Ports act as a natural decoupling point in the supply chain and hence represent the most convenient place to position inventory and undertake customising activities. This approach has been termed port centric logistics. This paper examines the issue of port centric logistics' location, and asks the fundamental question: is it best for distribution centre activities to be sited at a sea port, or at a location some distance inland? Whether or not to take a port centric approach based at specific sea ports or at inland locations is an important strategic decision for logistics organisations. Two case studies from the UK are examined and critically compared. In each, a different solution was adopted in practice – in Case 1 a sea port was selected for the provision of port-centric operations, while in Case 2 port centric activities were located to an inland location. The reasons behind each decision are suggested, assessed and debated. For each case, the importance of system value is considered in the light of its contribution to supply chain activity.

## **Literature Review**

### **What is port centric logistics?**

Fundamental to this discussion is the question of what is port centric logistics? The term means different things according to circumstance, and where the port's role is seen to offer the most efficient and effective solution the interpretation will vary depending on the supply chain strategy adopted. Thus the understanding of the reasons behind adopting a port centric approach is an area of the port centric literature that has not been closely examined. Many of the papers on port centric logistics are also quite conceptual and this paper provides an empirical study which will add value to the current knowledge base in this area.

Critical to effective freight distribution is location in relation to the customer base and connectivity with that customer base. This is most conveniently measured in the first instance terms of the long-established concepts of centrality and accessibility (Robinson and Bamford, 1978). Accessible, well connected locations either inland or in close proximity to ports benefit from lower total transport costs which are derived primarily from high quality road and rail links, or inland waterway links where available. This is further supported by economies of aggregation, scale and scope. From this, value added services have emerged at favoured locations where advantages of accessibility, connectivity, volume and intermodality coincide. This is classically at the land-sea interface.

The concept of port centric logistics has its origins in location theory (Haggett et al, 1977) and transport geography (Hoyle and Hilling, 1984). Location theory is built on the principle of 'place' which suggests that individuals, businesses and other entities are located or positioned both absolutely in terms of their 'grid' position and relatively in terms of their distance from, or proximity to, other entities. For businesses, what is of prime concern is whether they are 'badly located' or 'well located' in relation to sources of goods supply, or proximity to markets - and accessibility is a critical aspect of this.

With reference to ports, Notteboom and Rodrigue (2005) discuss development in a regional context whereby the influence of the port extends beyond the port boundary by means of broader strategies which link the port to the wider market through the development of distribution centres located close to ports. Falkner (2006) suggests there is a strong case for this 'port centric' approach to be developed further because maritime freight inevitably has to pass through ports. When this is linked to factors such as land availability, the removal of transport congestion between the port and the logistics centre, and the widely accepted 'port cluster' concept (De Langen, 2003), there is a strong argument for taking the port-centric logistics approach. Ports offer the opportunity to develop value added activities on site while at the same time providing the necessary impetus for further integration into the supply chain. However, optimisation of the complete supply chain is often not seen as a priority, with individual chain members optimising their own operations at the expense of the whole (Mangan et al, 2007). This disjointed approach is becoming increasingly anachronistic, particularly as it is now recognised that supply chains compete against each other rather than individual companies competing within the chain. In its mature form, this has become conceptualised as port-centric logistics.

### **Port centric logistics approaches**

Early manifestations of port centric logistics approaches include the development of dry ports (often referred to Inland Container Depots or ICDs), distriparks, districenters and logistics clusters. Dry Ports have been long established in Europe (Beresford and Dubey, 1990; UNCTAD, 1985) with initial development stimulated by the pressure from high inland transport and transactional costs and the desire to extend the benefits of containerisation as far inland from ports as possible. The inland leg is a crucial element of the supply chain from the point of view of operational efficiency and total supply chain cost (Pettit and Beresford, 2010; Stopford, 2009). The idea of the logistics cluster, which forms the backcloth to dry port development, encourages trade flows by funnelling them into specific corridors. In turn, scale economies can be enjoyed by means of freight traffic concentration and consolidation (Roso and Lumsden, 2009). Further, port competition has forced seaports to change their commercial strategies. Competition among ports has largely been replaced, it is argued, by competition between transport or logistics chains (Van Der Horst & De Langen, 2008). Ports have had to become competitive in all areas including their hinterland operations, and as a consequence ports can use inland terminals as "extended gates" through which flows can be better managed (Roso and Lumsden, 2010).

Ports and port companies which are organised in such a way as to become more closely integrated into the supply chain also tend to move higher up the value chain for products where it is appropriate and where the port acts as the import/export node (Potter et al, 2003). The concept of moving towards co-ordinated port based value added logistics services is not new, for example approaches include the Distripark concept where value addition activities are aggregated at one large site (Port of Rotterdam, 1988). Districenters were developed in continental Europe specifically by Nedlloyd, offering customer-tailored value added services. Elsewhere, evolutionary paths diverged with, for example, P&O Roadways offering integrated transport services without value addition through their road, rail and Inland Container Depots (ICD) network (Roadways, 2004). While a wide range of activities involving the change of state of cargoes to suit individual customers or markets are available at Districenters, they are not available at ICDs (Pettit and Beresford, 2009).

Developing effective supply chains requires the integration of all companies in the supply chain and ports play a key role in improving productivity in international logistics operations. Ports are a component of the supply chain where many opportunities for positive change have been identified and ports commonly offer a proactive environment where cutting-edge services will interface with a complex

transport and logistics environment (Pettit and Beresford, 2009). Optimising both port operations and the overall supply chain can lead to significant efficiency gains and optimisation strategies adopted by different companies may vary depending what they perceive the most effective solution to be.

The trajectory of development of ports has been tracked by, for example, Woo et al (2011) who show that port performance can no longer be measured in isolation. Rather, it should capture a number of elements of supply chain activities in order to provide a comprehensive picture. The idea, which is rooted in system theory, is to optimise value from the whole system rather than its constituent parts, such as a port, or a port centric based warehouse activity in isolation.

### **The Concept of Value**

Value from a system perspective can be conceived of as a multi-faceted concept. For instance, Bowersox et al. (2000) propose that: “value is the measure of desire for a product and its related services” suggesting customers have three value perspectives: low price – provided through efficiencies (*efficiency value*); *market value* achieved through product service positioning, i.e. assortment and convenience; and *relevancy value*, providing value where, when and how the end-customer wants it – accommodating the business/lifestyle of the consumer. They concluded that, “the provision of these combined values can be considered as the purpose of the firm”. Another way of conceiving a wider view of value can be derived from “Customer Value Criteria” first proposed by Johansson et al (1993). This assumes that value is built up of a number of four aspects: quality, service, cost and cycle time. To this can be added other criterion such as safety and emissions to reflect more closely to modern practice and demands of contemporary logistics and supply systems (Figure 1). The idea is that any potential improvement to an activity or process is evaluated from this wider perspective of the holistic supply chain against these criteria. Thus, ideally, changes should lead to increases in quality, service, and safety whilst simultaneously lead to decreases in costs, lead times and emissions. In reality there are often trade-offs to consider between these which is where a holistic appraisal comes in and judgement is invariably required. What is important to note is that cost minimization is not always equivalent to value maximization.

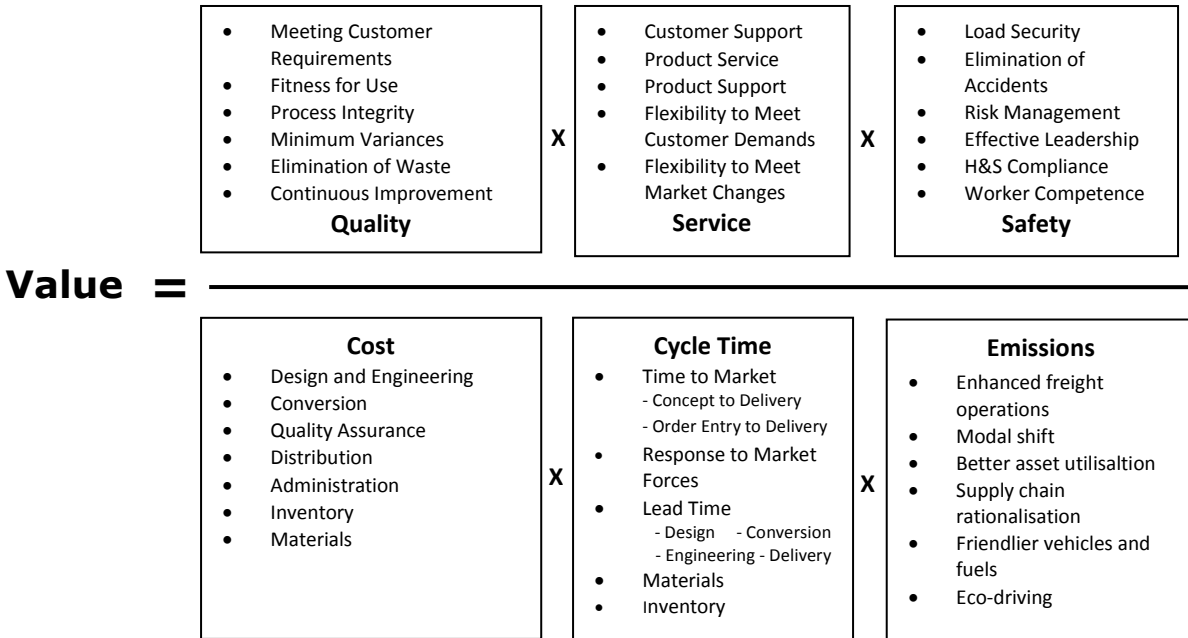
### **Where should port centric logistics facilities be located?**

Early models suggested by, for example, Hagggett et al (1977) and UNCTAD (1985) provide the clues to where distripark activities in a major new port development such as, for example, London Gateway should be located. The purpose of this research is to investigate, from a decision-maker’s perspective, the thinking behind port centric location decision-making which can be viewed from two different perspectives i.e.

- **Case 1:** moving distribution centre activities from an inland facility to a sea port location
- **Case 2:** moving distribution centre activities away from a sea port to an inland location

### **Methodological Approach**

The research method adopted here is the case study approach. The study is an exploratory piece of research which seeks to examine the reasons why firms decide on certain location alternatives for their port centric operations. Hence, a case study approach is appropriate as this permits for more in-depth research to be undertaken (Yin, 1993; Dinwoodie and Xu, 2008, Roh et al, 2015).



**Figure 1: Holistic Value Metric – developed from “Customer Value Criteria” proposed by Johansson et al (1993)**

The United Kingdom was selected as a geographic area for the study as it is a leading global economy, with a reasonable volume of inbound import freight movement and provided the option of sea-based or inland locations for port centric activities. In addition, with the development of the new London Gateway container port coming on stream from 2014 in a phased development, the inbound freight sector was facing a very fluid and dynamic period where location decisions such as these were being undertaken. Two companies were selected, each handling container based shipments imported from producers overseas, each with opposing views on the port centric location debate. Case Company 1 was a logistics service provider, part of a multinational group, who had made the decision to relocate their distribution centre for handling white electronic goods for a key customer from an inland position to a site at a sea port in the south east of the UK. Case Company 2 was a leading UK retailer, who although outsourcing much their logistics operations, retained overarching control and made decisions about where supply chain activities were undertaken. Semi-structured interviews were used as the main research tool. Senior personnel from both companies were approached with the Managing Director of the UK operation for the logistics service provider and a Supply Chain Director for the retailer being selected as interviewees. Secondary sources were also used to corroborate the findings adding validity to the research method. The analysis was undertaken from a supply chain perspective and assessed around whether each relocation decision provided extra value to the shipper customer or not, based on the extended “Customer Value Criteria” suggested by Johansson et al (1993) and presented in Figure 1.

**Results**

**Case1: Moving logistics functions from an Inland Location to a Sea Port**

The perceived advantages for the relocation of distribution centre activities from an inland to a sea based location are summarised as follows: firstly, time was removed from the chain of supply. Previously, when the product arrived at the port, it was processed through the port, gaining customs clearance, and then moved 100 miles by lorry to the inland distribution centre before being made

available to the shipper. Now, with the relocation of the distribution centre to the sea port of entry, the product was immediately available to the shipper, just having to be moved from the quayside to the adjacent warehouse. Secondly, the relocation to a sea port centric operation removed duplicated travel time for any products distributed to customers in the south east of the United Kingdom. The south east of the United Kingdom represents a significant market. When product was transferred to an inland distribution centre at the centre of the UK and then distributed to a London based customer it in effect went back and forth. This involved wasted miles which were removed by changing to the port centric operation in the south east of the UK. Thirdly the move from the central United Kingdom distribution centre to a sea port centric operation had an impact on delaying customs levies/duties/taxes. Previously, customs taxes were paid on the departure from the port before storage at the centrally located distribution centre in the Midlands. This distribution centre was not designated as a Freeport. As the port had Freeport status, and the product was stored in this location, this had the effect of postponing when the taxes were due to be paid delaying them until the product was actually called from the point of storage by the shipper customer.

A further advantage was that costs were saved in not having to return empty containers and packaging to the port from the central distribution centre. The containers and packaging to be returned were thus all located at the port, making it much more efficient to move these items back to the vessel for onward shipping. Fifthly, given that the amount of handling was reduced, there were also spin-off benefits of reduced damage and improved safety. As a result, the levels of service quality, expressed in terms of full and on time delivery of undamaged goods, improved after the reconfiguration to a port centric operation, and accidents over an extended period were also reduced. Sixthly, a further improvement was the reduction in CO<sub>2</sub> emissions following the move to the port centric operation. This stemmed directly from the reduction in shipment miles of product destined for south-east UK based customers, the reduction in miles for container and packaging returns and the lower levels of damage in turn requiring fewer remedial shipments and less rework. In summary, there were numerous advantages in terms of improving the value that the logistics service provider was able to offer following the shift from a centralised model to one based at a port. Given this evidence how could it be argued that a decision, which is the very antithesis of the one investigated here, also make sense?

## **Case 2: Moving logistics functions from a Seaport to an Inland location**

A range of advantages were also derived from this contrasting strategy involving the relocation of the logistics operations away from a sea port into an inland location. The reasons for this are summarised below:

Firstly, flexibility was improved. Flexibility is an important supply chain attribute to be able to provide value even when circumstances change. By being previously located at a single sea port for storage of inbound container products the choice of inbound route was restricted. It made sense to route all inbound cargo imports through this point of entry into the United Kingdom. Given the changes that were coming on stream in the United Kingdom in terms of container ports noted earlier in this paper (notably, the development of London Gateway) this has become a more problematic issue to consider. By locating inland in terms of product storage at the distribution centre the shipper was not as tied to this one particular seaport location and hence imports could be handled just as easily through any of the main sea ports. Secondly, by relocating inland, the shipper has substantively increased their options in terms of the modes that could be deployed to serve its inbound supply chains. Previously, when located at a sea port, the only convenient transport mode for imports was shipping. Now, with an inland location sited on the main road and rail arteries that serve Europe, modal choice was increased.

Strategies have shifted in recent years so that a hybrid approach to sourcing is often deployed - purchasing from low cost, usually Asian-based suppliers, where cost minimisation is the aim, in combination with supply sources where low cost is combined with tighter lead times to aid a more responsive approach - this means purchasing from Southern and Eastern Europe suppliers. These shipments are normally served by road, or sometimes rail, supported by short-sea shipping to accommodate the inbound supply mix. Thirdly, product moved in containers over large distances between continents by sea benefits from a good deal of effort to optimise the use of the cubic capacity available - this obviously has a substantial impact on the number of containers required helping to reduce shipping costs. Savings can be considerable when sourcing supplies over long distances - when a sea port-centric approach is taken, the container is emptied at the sea port; this leads to the loss of the advantage of the intensity of packing for the inbound leg. However, when an inland warehouse is used the container can continue on the land leg, remaining full for the maximum distance from the port of entry to a location close to the customer (see, for example Beresford and Dubey, 1990). This will also have a probable positive impact on quality and safety as the container will pass through to the inland leg of the journey completely inter-modally without the container having to be unloaded or refilled.

This point also has a bearing on the next argument for an inland location – making the maximum use of rail. First, intensively packed containers, which are weight-legal for rail transport are often over the legal weight limit for road. Thus distribution by intermodal means is encouraged with the break of bulk occurring at the inland rail terminal. Hence, rail becomes the better option for the initial transport for imports inland from the port. Secondly, the inbound flow is still a push flow, whereas the storage of product at the sea port would convert the flow to a pull flow where onward shipment is triggered according to customer requirements. This characteristic means that rail option is more attractive for push flows as these tend to be more volume based. There are clear advantages of using rail in terms of cost reduction and emissions per item moved. Also, in this case, the inland location of the distribution has an additional advantage: it can fit the Freeport concept by permitting, or even encouraging, the deferment of payment of taxes, duties and levies until the goods leave the boundary of the centrally located distribution centre. Finally, there are considerable synergies that can be enjoyed in managing the inbound distribution centre in concert with outbound flows. For many products which may be ordered, for example, via the internet by end customers, the strategy currently often adopted in the United Kingdom is to manage one central stock holding point. By either using the inbound distribution centre simultaneously as the outbound distribution centre or locating the outbound distribution centre within close proximity to the inbound port centric distribution centre operation, great potential synergies can be obtained. In particular, responsiveness to end customer orders becomes better.

### **Summary and Conclusions**

The research is focused on a highly topical area. Interest in port centric logistics has heightened considerably in recent years due to a range of factors that are set out in the paper. The research sought to investigate the comparative advantages of two alternative strategies that could be adopted in port centric approach. The understanding of the reasons behind adopting a port centric approach is an area of the port centric literature that has not been closely examined. Many of the papers on port centric logistics are also quite conceptual and this paper provides an empirical study which will add value to the current knowledge base in this area. The decision behind whether to locate a port centric approach around a specific sea port or inland is a key strategic call for many organisations. Currently, as logistics is such a dynamic domain, it is important to keep abreast of the very latest thinking and incorporate a good knowledge of all the impending issues that may affect judgement views. Hence this paper will be of considerable interest to practitioners confronting this kind of decision.



A model for gauging customer value, used originally by Johansson et al (1993) and extended in this paper to include the wider values of safety maximisation and emissions minimisation, was presented. As noted in the literature review, modern logistics has moved today from being dominated by a cost minimisation agenda to one where a much wider range of value criteria are used to assess the value of logistics services. In addition, the breadth of stakeholders has also widened and now includes a clear voice for other parties than just the shipper customer: for example, the broader based sustainability agenda suggests that societal and environment issues need also to be taken into account in supply chain design issues not just economic concerns. By deploying this updated customer value model with a widened interpretation of value, it can be seen that both options have potential benefits across all of the metrics. Each is presented briefly in turn.

For Case Company 1 the advantages of such a move were identified as a reduction of lead time, a lowering of costs and decreases in environmental externalities. It is also suggested that this approach would lead to an improvement in quality, safety, and service aspects from a supply chain perspective. So, on all metrics, enhancements in value for the shipper were realised by the relocation of distribution centre activities for handling inbound import product flows from an inland to a sea port location. Also, however, for Case Company 2 the findings indicate that there were clear advantages in re-locating distribution centre activities from a sea port base inland. Again, lead times, costs and notably environmental externalities were reduced, while improvements could in addition be measured for quality, safety and service. Also, importantly in the judgement behind the decision, greater flexibility to accommodate the use of different inbound transport modes and adjust to changes in any port of entry that may occur in the future was provided by this solution.

The findings create new knowledge in the area of understanding the reasons behind adopting alternative port centric location decisions. The study has shown that the location decision, when considering a port centric approach, is highly contingent to particular circumstances faced. There is no generic “right answer” when it comes to determining the best decision. Also, the research underlines how important it is to holistically appraise the situation when determining the location of a port centric activity. This means not just evaluating the decision from a supply chain perspective, rather than from optimising a specific supply chain leg, but also by referring to a wider criteria base than just cost. Other value metrics, some not quantitatively based and hence harder to evidence, also need to be included in coming to any decision. Finally, consideration should also include a time dimension. Investments in port centric logistics are often considerable, and hence during the lifetime use of the project circumstances may change. The decision has to be fit for purpose over the whole period of use, sometimes many years. Flexibility criteria are hence important so that the ability to adapt easily to changing circumstances can be built in. For inbound flows to the United Kingdom there is considerable uncertainty, for example concerning the future success or otherwise of London Gateway as a viable competitive container terminal and what impact it may or may not have on inbound flows of product over the next decade or so. Location decisions must be made in respect of being fully mindful of all possible scenarios. The research has shown that there are potentially considerable benefits to either location decision. What is important is to use judgement to arrive at the best decision for the specific circumstances each decision maker faces.

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