

DEVELOPING A CONCEPTUAL FRAMEWORK OF INTERNATIONAL LOGISTICS CENTRES

*Jun Du, Logistics and Transport Research Group, Department of Business Administration,
School of Business, Economics and Law at University of Gothenburg, Sweden P.O. Box 610,
SE 405 30 Gothenburg, Sweden. E-mail: du.jun@handels.gu.se*

*Rickard Bergqvist, Logistics and Transport Research Group, Department of Business
Administration, School of Business, Economics and Law, Gothenburg University, Sweden, E-
mail: rickard.bergqvist@handels.gu.se*

ABSTRACT

This paper looks into the development and characteristics of logistics centres by conducting literature review. A cluster analysis of diverse terms and concepts relate to logistics centre is conducted. The analysis identifies three clusters of logistics centres, namely; dedicated for production and trade development, specialization in logistics and cargo handling, and comprehensive logistics centres. In order to react on the ongoing process of restructuring of the transport and logistics industry leading to a higher degree of concentration and internationalization, logistics centres either specialize in goods handling and trade development; or become more integrated and comprehensive. Amount of concepts and definitions of logistics centre cover the fundamental aspects of the term, however, international logistics centre as an ultimate development stage should include much more than that. In order to define the concept of international logistics centre, the evolution process of logistics centres is investigated.

*Keywords: International Logistics Centre, Logistics Centre, International Transportation,
Public-Private Collaboration*

INTRODUCTION

In the context of globalization and logistics a lot of focus is put on the efficiency of supply chains and the development of logistics centres to meet the future changes and challenges in the global market.

The appearance of logistics centres was stimulated by the globalisation of business processes, the search for new business solutions and inter-collaboration possibilities. (Meidute, I. 2005) Logistics Centres aims at supporting seamless integrated transport network that can enhance the attractiveness of the market and competitiveness of the encompassed companies, as well as establishing a prestigious reputation through continuous improvement.

There is a diversity of concepts related to logistics centres that differs based on attributes such as geographical coverage, market conditions, range of operation and services, management structures etc. Meidute (2005) compared various definitions of logistics centres and concluded that 'there is no clear view point on a single definition of logistics centre.' (Meidute, I, 2005, p 110). Logistics centre is a term widely and commonly used in for example Japan, Singapore, China, and USA (Meidute, I. 2005). There is a distinction between 'conventional' logistics centre such as pure transshipment terminals and various types of large-scale intermodal logistics centres which are mainly developed in a public-private collaborative context. (Höltgen, D. 1995) According to Rimiene and Grundey (2007), 'the heritage of theory development and empirical research on unified concept of logistics centres is quite poor in comparison to other disciplines.' They explained that one of the reasons might be a rather short history of supply chain management theory. The other reason is that the concept is partly an outcome of the evolution process and new types of centres have been continuously developed (Kondratowicz, L 2003). Yet another reasons presented by Bichou and Gray (2005) is that the terminology has been developed over time by different entities without any consideration to the comprehensiveness of the concept as a whole. Notteboom and Rodrigue (2009) stated that the reason for the lack of consensus lies in the multiple shapes, functions and network positions these nodes can have. (Notteboom and Rodrigue, 2009) Therefore before looking into International Logistics Centres (ILC), diverse logistics centre related terms and concepts are studied based on literature review, in order to understand the development of logistics centres which could shed some lights on the evolution of ILC.

The purpose of this paper is to discuss and propose a standard concept to capture the evolving process of ILCs through identifying the decisive factors based on the understanding of the relevant definitions and the literature review.

The questions addressed in this paper are: 'What is a suitable definition of an international logistics centre?' and 'What is the nature of the evolution process of ILC?' The first question addresses the static situation and nature of an ILC, while the second question relates to the dynamic process of developing ILC. The lack of consensus on the definition of logistics centre brings challenges to define ILC. A basic element of a logistics centre is at least a terminal, whereas the most advanced logistics centre not only interest and involve actors in transport and logistics industry, but also related industries, government, and society as a

whole. This paper intends to investigate on the evolution process of logistics centre, which is a dynamic process that evolves from the basic unit to the most advanced stage, namely, ILC. By understanding this evolving process, the definition of ILC can be comprehended from a dynamic and evolutionary perspective. It can provide a common ground to investigate how to develop ILC successfully, which is an emerging field that deserves researches and studies. It would benefit not only actors in logistics and transport system, but also the region it serves. Public authorities and private actors can better collaborate with each other to attract and facilitate global trade flows and investments, improve the transport infrastructure and logistics market conditions. Combined, it may improve the cost-efficiency, environmental performance, and quality of the logistics system. Therefore the comprehension of the concept is essential regarding scientific, commercial, and governmental attitude of any region (Rimiene, K et al. 2007).

The proposed conceptual framework of logistics centre is based on a literature review to identify the characteristics of logistics centres. The analysis is done by a cluster analysis¹; drawing from eight attributes of eighteen subjectively chosen logistics centre related concepts in order to compare the commonalities and differences. It is not only the definition that is taken into account, but also the notion of the content based on the context, case studies, etc. The evolution process of ILC is analyzed based on the results from the clustering analysis and level of internationalization. The analysis of different concepts and definitions from academic papers are conducted based on original research purposes and questions, in order to review the definitions and their underlying background.

THE CONTEXT OF LOGISTICS CENTRES

Logistics centres act as nodes and when interconnected through transportation it links suppliers and consumers. The collaboration between logistics centres develops in parallel with the collaboration between suppliers and buyers across the supply chain. As the demand and complexity on the supply chain network increase, it requires logistics centres to offer services in order to meet customers' demands.

According to Riminene et al (2007), the logistics centre concept appeared around 30 years ago and can be classified into three different generations (United Nations, 2002) over the course of its evolution. Over time there have been changes to how things are handled, stored, produced and moved, which have been significant for the development of logistics in general and for the function of logistics centres in particular.

The history of logistics centre can be traced back to the ports as the main economic areas that shape the merchandise flow routes between countries. Taxes/customs were charged on merchants to sell their goods in the country, which requires high investments depending on the amount of goods before trading. Afterwards the economic free zones (zona franca) were established in a delimited area around major ports where goods could be handled and stored without the intervention of the customs until good were sold and traders made the

¹ Cluster Analysis is a method that helps to compare the similarities and differences among a certain amount of items regarding some defined attributes in order to group these items into different clusters for further analysis.

declaration. These places were the origin of the logistics centre which provides warehouse and handling services.

There have been discussions about the relationship between port and logistics centre. According to UNESCAP, there is a positive correlation between cargo flows at the logistics centre and the number of ships calling at the port. Port and logistics centre have been developing together to enhance the competitiveness of the region, as mega ports such as Hong Kong and Singapore have been developing logistics centre to attract business and trade and enhance port function as a gateway to support the long-term development vision. There are discussions about if ports can be regarded as part of the logistics centre or not. According to Cullinane, ports have invariably not been established for the same purpose as logistics centre because the main purpose of port is simply the loading and discharging of ships. To be counted as a logistics centre, they need to have functions and services more than this (i.e. more specific logistics activities). Therefore, depending upon what functions or activities are performed within the port, some ports are logistics centres, while others are not. Regarding ILCs, port and airport can be regarded as part of the functions of ILC because successful development of logistics centres cannot be realized without these key functions, but the requirements to be qualified as an ILC includes more functions than that. Notteboom and Rodrigue (2005) identified a 'port regionalization' phase that support this argument because seaports become more and more integrated with inland distribution systems for efficiency improvements during the evolution process of ports' role in modern supply chain management (Notteboom and Rodrigue 2005). Bichou (2005) asserts that this process may prove to be beneficial to ports at several levels, namely, diversification of port services mix, improvement of landside networks, stimulating the regional socio-economic development, as well as enhancing ports competitiveness. The most important is that 'it enables ports to fully integrate the logistics and transport chain, hence providing for an effectual and central role for ports in competitive and efficient global logistics and distribution system'. Therefore the evolution process of ILC is facilitated by the development of port-hinterland linkages to function as an internal system of the region it serves.

The concept of logistics centres emerged in parallel to outsourcing and third party logistics as the focus moved towards developing multi-functional and integrated services, often in remote regions. Globalization and international trade have brought new development and trends related to logistics centres. Logistics centres have been consolidated into larger and fewer regional centres which serve a wider geographical area in response to multinational companies' global logistics strategy and coverage. The main drivers behind this are cost reductions in, e.g. facility investment and total inventory, and increased competitiveness (Teo, Ch. P. 2001).

What mark the different generations of logistics centres are the shifts in scope of logistics activities and the services offered. In general, logistics centres have developed beyond traditional activities such as storage, receiving and dispatching, break-bulk and consolidation, into offering integrated logistics management, value added services including labelling and bar coding, procurement and vendor management, customer service functions (e.g. return, repair, rework, and assortment promotional assembly), as well as ICT for inventory control, tracking and tracing (Rimiene, K et al. 2007).

The development of international trade and industry distribution patterns has had impacts on the development of logistics centres as they have been recognized as a strategic

capability of a region and a great contributor to regional competitiveness and attractiveness. Hence, the role a region plays in global supply chains partly determines the characteristics of the logistics centre (Nijdam, M et al, 2005). Furthermore, the environmental impacts arouse significant concerns for the sustainable development of logistics centres, such as congestions, emissions, energy use, and external cost on the society. Consequently, logistics centres are developing not only on the basic functions as transport, goods handling and warehousing, but also oriented to all segments of the supply chain including production, retailing, or recycling (NeLoc. 2003).

CONTEMPORARY DEFINITIONS OF LOGISTICS CENTRE

There are many similar logistics centre concepts and definitions. According to Rodrigue and Notteboom (2008), as the development of functional specialization on inland terminals with cluster formation of logistics activities, the dynamics in logistics network lead to a process of logistics polarization and the creation of logistics zones. Take Europe as an example, the concept of logistics zones in the hinterland is called *plateaux logistiques* in France, *Interporto* in Italy, *freight villages* in UK, *Güterverkehrszentrum* in Germany. They equate to the concept of logistics centres, but specify the hinterland location. These terms are usually created within the framework of regional development policies as joint initiatives by companies, intermodal operators, regional and local authorities, the central government and/or the chambers of commerce (Rodrigue, J.P & Notteboom, T. 2008). Rimiene and Grundey (2007) evaluated the presence and scope of logistics centre definitions and concluded that logistics centre can be considered as freight village, transport node or distribution centre. They also consolidated a range of ancillary activities concluded that the logistics centre is defined as 'a special intermodal hub (nodal point) in the transportation system including different logistics facilities, where separate operators are providing a number of services, connected to transportation, logistics and distribution in established geographical coverage.' (Rimiene, K et al. 2007, p 93) Logistics centres are sometimes also called: *Centres Logistiques de Fret*, *Gares routières de Marchandises*, *Logistics park*, *Platform Freight Terminal*, *Logistics Nodes*, *Centro Integrado de Mercancias*, *Transport Center*. Despite various names, logistics centre is regarded as not only a focal point for goods flow, but also as a stimulus to generate business and trade, as well as facilitate economic development (Hamzeh, F. et al. 2007).

The concept of a logistics centre is defined by Europlatforms as 'the hub of a specific area where all the activities relating to transport, logistics and goods distribution - both for national and international transit are carried out, on a commercial basis, by various operators. A logistics centre must also be equipped with all the public facilities necessary to carrying out the above-mentioned operations. If possible, it should also include public services for the staff as well as users' equipment. In order to encourage intermodal transport for goods handling, a logistics centre should preferably be served by a variety of transport methods (roads, rail, sea, inland waterways, air.)' (EEIG, E. 2004). According to EEIG, this concept is based on three elements which generate other relevant effects on economics and transport standpoints, namely territorial planning alongside infrastructure rationalization, transport

quality, and intermodal development. Logistics centre locates in a defined area, often at a nodal point of a transport system. It acts as a node connecting transport links with the aim to improve the land use as well as the transport quality. The infrastructure and pooling of resources are intended to generate value to the tenants. The service standard and quality performance has to be met for commercial and sustainable transport solutions. The integrability, cost advantage, quality advantage, and environmental advantage are concepts stressed for intermodal transport to achieve significant, sustainable competitive advantage (SSCA) (Jensen, 2008).

Moreover, the definition also specifies that: 'logistics centre must be an open centre for all interested companies, and the location should be attractive for cargo from different major international transport corridors.' The nodal point location may help logistics centre to operate in an environment of comparatively convenient transport system and stable cargo traffic. Per definition, logistics centre supports free competition on site, and intends to generate synergies among companies that use transport and logistics services with the potential benefit of economies of scale. The companies can also improve their economical and productive performance through cooperation. The management should be a single and neutral legal body. A public-private partnership (PPP) set-up is preferred, because the management of the centre can be separated from individual commercial and operational activities (EEIG, E. 2004; Tsamboulas and Kapros 2003). In practice, there are also private logistics centres which are popular especially in France, UK, and USA. The organization structure has been stressed in the definition of logistics centre because 'a legal neutral body can act on behalf of the transport framework centre, and secure the common interests of the logistics centres located companies'(NeLoc. 2003, p 6). The ownership is an important aspect to indicate the support for regional cooperation and development. On the whole, the definition given by Europlatforms covers various aspects of logistics centres: geographic coverage, infrastructure, equipment and facilities, functions and services, intermodality and sustainability, transport performance and quality, as well as management and ownership.

All the concepts of logistics centre mentioned above mainly concern the operational aspects of logistics centres with the emphasis on infrastructure, functionality and services. Besides that, organization structure and business development that can generate trade and cargo is of particular importance. The above mentioned definitions of logistics centre don't explicitly mention the non-operational attributes such as value creation to the users, commercial services, efficient networks at both virtual and physical level, as well as transaction flow and marketing function.

LOGISTICS CENTRE CHARACTERISTICS

The logistics centres services can be categorized as basic logistics services, ancillary services, and value-added services (see Figure 1). The infrastructure includes both hardware aspects (e.g. facilities and equipments) and software aspects (e.g. ICT). The infrastructure development enables tenants to access to common facilities according to cost sharing principles or as a common good (NeLoc. 2003). The most important infrastructures inside a logistics centre are the warehousing and intermodal operations (EEIG, E. 2004).

Since a logistics centre incorporates terminal operations, the basic services include storage, cargo transfer, consolidation, distribution, cargo handling, sorting and packing, intermodal transportation (Rushton, A et al. 2006: Ballis 2004). The ancillary services are mainly vehicle auxiliary services, public and commercial services, as well as custom services, for example, submission of vehicles/semitrailers/containers, reverse-logistics services (Meidute, I. 2005), customs mediators, maintenance and repair of transport facilities (Lingaitis, F. 2003). Some of the logistics centres such as dry ports have the function of custom clearance, which means that international cargo can go through customs with duties taken only when the cargo leaves the zone (Rimiene, K et al. 2007: Ng and Gujar 2009). The value added services are the services that can directly add value to products, such as goods processing, inspection, labeling, packaging, bar-coding, final assembly and adjustments. According to Meidute and Vasiliauskas (2005), services provided by logistics centres 'depend on the predominant function, size and range of operation'. To accommodate demands new services are continuously developed in logistics centres. De Koster, and Warffemius (2005) state that the widespread of logistics centres services indicates not only an increase in number but also the functionality is changing. Although there is a common background of the terms (Roso, 2009), differentiation is one of the keys to achieve competitiveness. Therefore a logistics centre should operate within the geographic, economic, political, and social context to establish an effective and efficient network that can attract cargo flows and investments, as well as meet customers' expectations.

Ownership is another important aspect of a logistics centre. There are three main types of logistics centres regarding ownership, one type is owned by private companies mainly serves their interests; the second type is owned by a body (such as a public authority) that allows open access for all interested parties; the third type is based on private-public participation (PPP-model). A more "private" body would prioritize investments that can benefit the companies rather than for the purpose of regional development. The ownership structure is thus important since it can be used as an indicator to which extent logistics centres intend to drive regional development. The structure is also important for logistics centres long term development because it is one of the key determinants for the success of logistics centre (NeLoc. 2003). It is stressed that the management should be separated from the daily operation per definition.

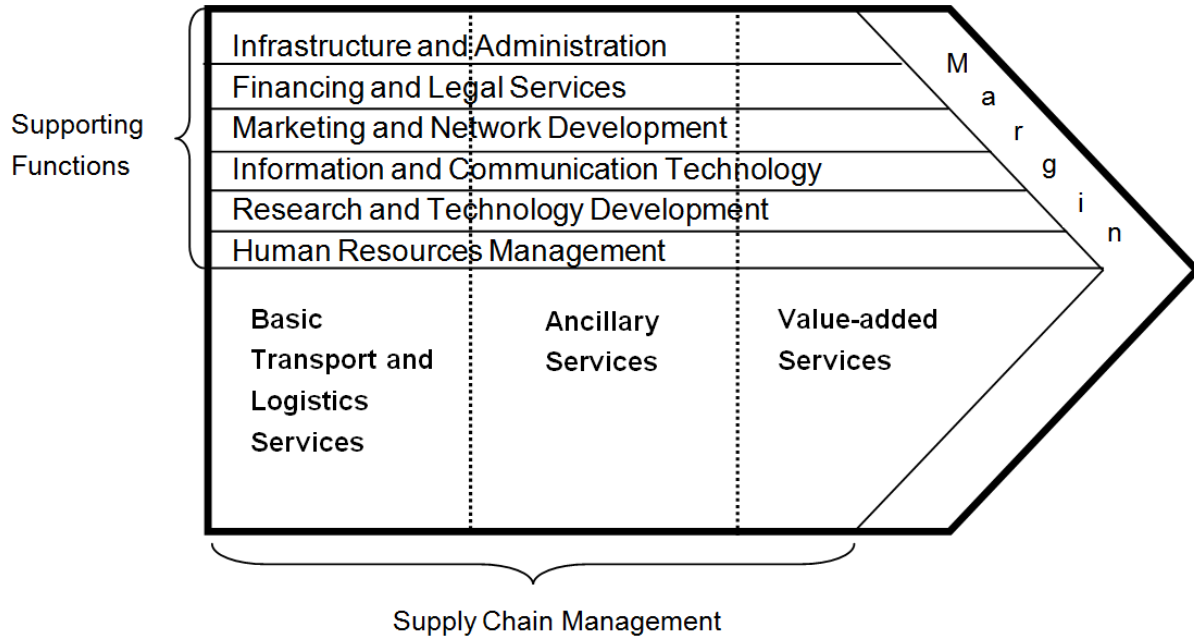


Figure 1. The Overall System of Logistics Centre Services. Source: Modified from Porter (1985)

ILC should be understood with a scale and scope in mind. In this section eight attributes are presented that are of special important for the development of logistics centres. These eight aspects are used as decisive factors that have been identified through the review of previous research in the field.

These attributes have been selected based on the criteria that they should significantly contribute to the success of the Logistics Centres and that they should be decisive factors that determine the level of internationalization of Logistics Centres. The transport modes are an important part of a logistics centre, Notteboom & Rodrigue (2005) listed it as one important dimension of inland terminals which also include logistics centres. Another dimension that was considered when evaluating the characteristics was the geographical coverage that the logistics centre has. Furthermore, customs formalities and value added logistics services were identified as primary functions for logistics centres (Nottboom and Rodrigue 2005). In logistics centres there are many different actors involved, these actors provide different functionality and some of them provide logistics services. For this reason TPL providers constitute an important part of the services that are provided by a Logistics Centre (Rimiene et al. 2007). Many logistics centres choose to distinguish themselves by offering extra services in the form of commercial and public services. (Cerreno et al. 2008) Although it cannot be said to be typical for logistics centres but it instead serves as a distinguishing factor that can be used by regions to gain competitive advantages when competing for cargo volumes (Notteboom and Rodrigue 2005). The development of logistics capabilities is not sufficient, marketing of place image is essential to attract new business and continuous develop logistics centre (Bergqvist, R. 2007). Marketing could also be used as a tool to gain competitive advantage and further enhance the attractiveness of the location (Porter 2001). For these reasons marketing aspect is regarded as an important attribute of logistics centres. Another important aspect of logistics centres is horizontal networking,

Logistics centres networking are often established through different organizations which are active on various levels of hierarchy to establish various platforms and facilitate the sharing of know-how and resources to strengthen the competitive advantage on a national and international level. Therefore the last aspect of logistics centres is the horizontal collaboration between different logistics centres.

Although there is no standard of the logistics centre features, these aspects are selected based on the key characteristics necessary for the success of logistics centres. The selection is based on the tangible functions and services rather than the intangible aspects such as synergies, business development and economic effect, because the intangible ones can hardly be measured therefore varies from case to case. Although there are aspects other than the ones presented in this section, the selected ones are the most important attributes from the literature review perspective. Therefore further study would be interesting to complement with the results in this paper.

Geographical Coverage (A)

One differentiating factor is geographical coverage of the areas served by the logistics centre. As some centres focus more on regional and national distribution while others serve larger geographic areas and can therefore be considered to provide an international coverage. The majority trade lanes can be used to indicate the level of internationalization. The more internationalized, the more supply chains permeate several countries and may extend to several thousand miles from one continent to another.

Transport Modes and Corridors (B)

Intermodal development is one of the features of a logistics centre; however there are some types of logistics centres where the intermodality aspect is limited to certain modes of transport. There are logistics centres that cover all transport modes and there are also other types that are more specialized such as dry ports, interporto and inland hubs, which usually rely on road and rail transportation; there are Centro Integrado De Mercancias solely use road transportation. There are also some logistics centres can access to all transport modes but are not equipped for transshipment of intermodal transport unit (ITU) which means although they are multimodal but not intermodal (Cerreno, A et al. 2008), whereas others have dedicated freight transfer facilities to connect between these modes. The transport mode is often associated with the transport corridor, its size and geographical characteristics.

Third Party Logistics Services (C)

Logistics centres offer diverse levels of services, including third party logistics services (TPL) which provide integrated transport and logistics solutions through close and integrated relations to the business sectors, and are serviced with transport and logistics solutions (Johannsen, H et al. 2007). To which extent the logistics centres offer integrated logistics services vary and therefore this is a factor that can be used to distinguish different levels of logistics centre development. The value added services are not traditional third party logistics services therefore it is listed separately.

Value Added Logistics Services (D)

Logistics centres have the development tendency to offer value added logistics (VAL) services which are different from TPL services because these activities add value directly to the products. In this paper VAL services include: inventory management, goods processing, inspection, labelling, packaging, bar-coding, order picking, adding parts, final assembly, semi-manufacturing, maintenance and repair, reverse logistics, quality control, testing, installing, adding instruction manuals, as well as product customization. This factor is a combination of scale and scope.

Commercial and Public Services (E)

Some logistics centres develop diverse community related businesses and thus become commercialized. Commercial activities such as restaurant, hotel, retail store, shopping mall, non-freight office space, financial institution and other similar activities that can be used by communities are considered to be commercial services. Public services are usually showers, post offices, banks, parking area, truck stops, rest areas, veterinary services etc. These services are not likely to determine the success of the logistics centre but it indicates the community integrated level of logistics centres. This commercialization is not typical for logistics centres because it is more diversified from the core business of logistics centre; therefore this feature is regarded as a distinguishing factor.

Customs and Administration (F)

In order to facilitate trade and business development, some of the logistics centres provide customs and formalities services such as custom clearance, document handling for export and import of goods.

Marketing (G)

Whether or not strategic marketing is emphasized in the definition could gain competitive advantage of differentiation and further enhance the attractiveness. There are many ways that a logistics centre market themselves but the most common way is through place marketing and/or promotion of logistics capabilities and sustainability. Therefore whether or not actively market themselves is a factor that reflect the strategic recognition of marketing and the level of internationalisation of the logistics centre.

Horizontal Collaboration and Networks (H)

All logistics centres are part of a larger freight flow network, but there are differences in to which extent they collaborate with each other. The network is explicated as a widely branched group which work and help each other, based on mutual reciprocity and obligation, and continuous developed by contract and communication (NeLoc. 2003). For example, hauliers co-ordinate long and short haul services, joint use of warehouse space, or 'freight exchange' to improve vehicle load factors etc. As the connecting network and offered services expand, the more profound is the need for collaboration between actors in the logistics centre. Hence, this factor is regarded as a good indicator of the level of internationalization combined with offered services.

CLUSTER ANALYSIS

According to Rodrigue and Notteboom (2008), the range of functions of logistics centres varies from simple cargo consolidation to advanced logistics services. The comparison of different concepts and definitions is designed based on eight selected factors/attributes in order to find the commonality and differences among them. These attributes are constructed based on the previous discussion.

In order to distinguish the scale and scope of different concepts of logistics centres, the figures are drawn with a scale of 0-3: 0 score stands for none existing attribute; 1 score stands for limited attribute; 2 score stands for a developing attribute; and 3 score stands for a well developed attribute.

The radar charts are constructed based on a comparison of the collected concepts and definitions given in the appendix as well as the authors own judgement regarding the defined attributes. The definitions collected (Appendix 1) represent a relatively common understanding for each concept and term. The criteria for the score of each attribute are explained as follows. The grading is based on the explicit statements of the definitions of each term or the notion of the content derived from the context, case studies, etc that can meet with the following criteria.

Table 1. Explanation of the Grading Criteria

Factors		Low Service Level	←————→	High Service Level
		1 Score	2 Score	3 Score
A	Geographical Coverage	Local level	regional level ²	Inter-continental level
B	Transport Modes and Corridors	One transport mode	At least two transport modes	More than two transport modes
C	Third Party Logistics Services³	Few TPL services	Several TPL services	A strong presence of TPL services which are seen as a core component
D	Value Added Logistics Services⁴	Minor services would increase the value of products	Services that would directly increase the value of products such as repair & packaging	Semi-manufacturing, assembly of parts, product customization
E	Commercial and Public Services	Simple services such as restaurant, shower and fuel station	More sophisticated services such as banking institutions, hotels etc	A variety of facilities and services that can be used by communities
F	Customs and Administration	Custom clearance services are emerging	Custom clearance services are available but not always the case	Custom clearance services are well established
G	Marketing	Passive marketing, mainly through information distribution	Semi active in marketing often through a dedicated department representing the LC	Actively engaged in marketing the LC, dedicated unit for marketing purposes in a wide network

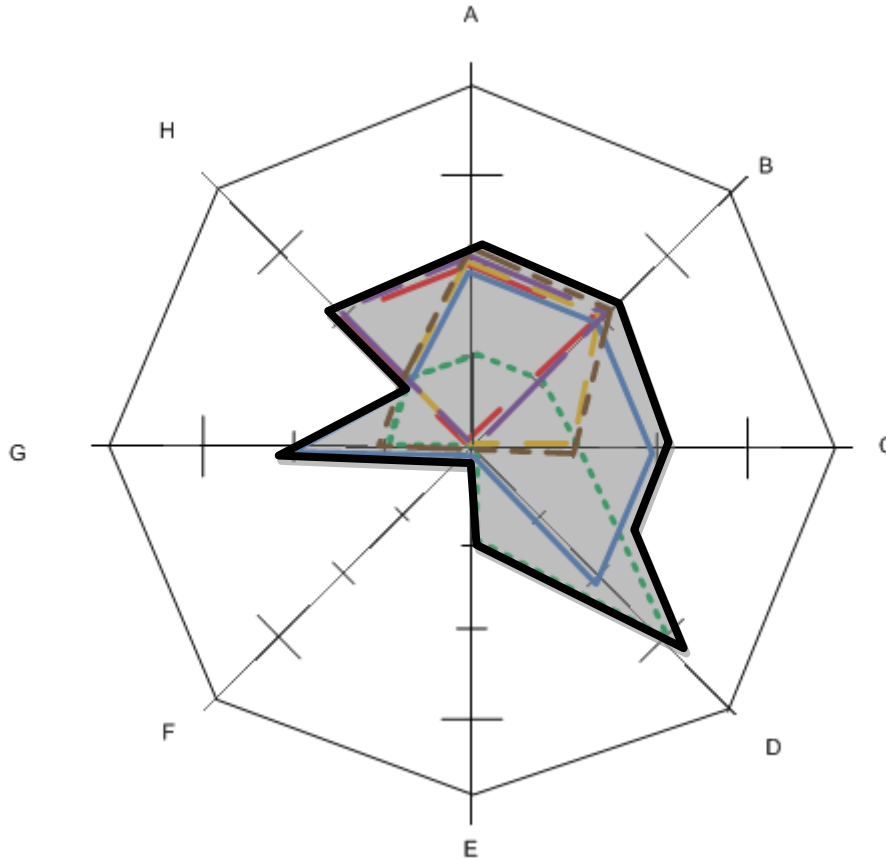
² The regional level can be within a country, or more than one country but within one continent.

³ See Appendix 1

⁴ See Appendix 2

H	Horizontal Collaboration & Networks	Little if any contact with other LCs	Collaboration with other similar LC in the vicinity in one country	Collaboration at a wider than national network
----------	--	--------------------------------------	--	--

From the analysis, three clusters are identified as illustrated in Figure 2 to Figure 4.



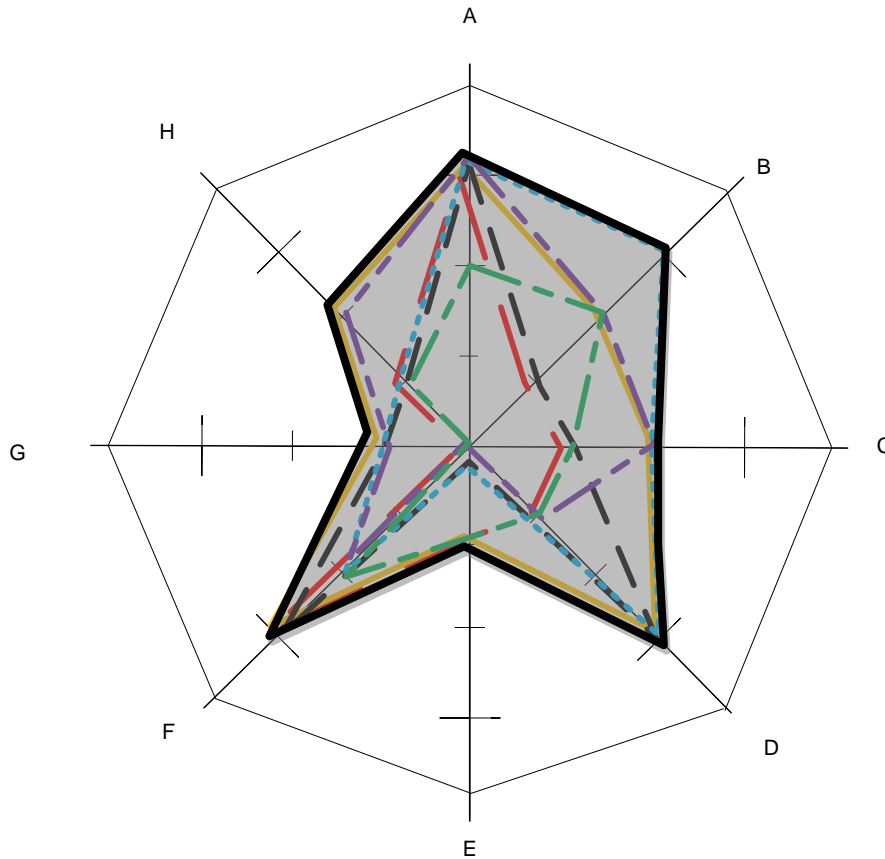
Legend	Concepts	A	B	C	D	E	F	G	H
-----	Industrial park	1	1	1	3	1	0	1	1
— — — —	Load centre	2	2	0	0	0	0	0	2
— · — · —	Transfer terminal	2	2	0	0	0	0	0	2
— — — —	Hinterland terminal	2	2	1	0	0	0	0	1
— — — —	Intermodal terminal	2	2	1	0	0	0	1	1
————	Intermodal freight centre	2	2	2	2	0	0	2	1

Figure 2. Cluster 1

The cluster 1 (see figure 2) is relatively well developed when it comes to geographical coverage and transport modes. Some of the concepts have more strength in providing value added services. One commonality in this cluster is the lack of customs and administrative services. This cluster appears to be more focused on transportation, and logistics. Furthermore there is limited development on additional functions that are not related directly to the transportation and logistics activities.

As can be seen from the chart the concepts have developed more and more in their scale and scope of services. The development can be seen perhaps most clearly in the

development of the value added services, which develop from none to a full range. Industrial Park can be grouped not only in this cluster, but also in the cluster 2 as being a very basic phase.



Legend	Concepts	A	B	C	D	E	F	G	H
— — — — —	Centro integrado de mercancías	2	2	1	1	1	2	0	1
— — — — —	Inland clearance depot	3	1	1	1	1	3	0	1
— — — — —	Free trade zone	3	1	1	3	0	3	1	1
— — — — —	Inland intermodal hub	3	2	2	1	0	2	1	2
— — — — —	Inland port	3	3	2	3	0	2	1	1
— — — — —	Distripark	3	2	2	3	1	3	1	2

Figure 3. Cluster 2

Cluster 2 (see figure 3) has the characteristics of well developed geographical coverage, customs and formalities, and value added services. But they have relatively few commercial and public services as well as a limited marketing attribute. These concepts and centres have the characteristics of facilitating trade by incorporating the customs function or develop the functions as free trade zones to promote regional development and economic growth. However, as the development of trade liberalization through international, multilateral, and bilateral agreements, demand for customs services have decreased, therefore it has to develop strong logistics and transport services in order to add value to customers. With the focus on value added services and the advantage of international coverage, this cluster has

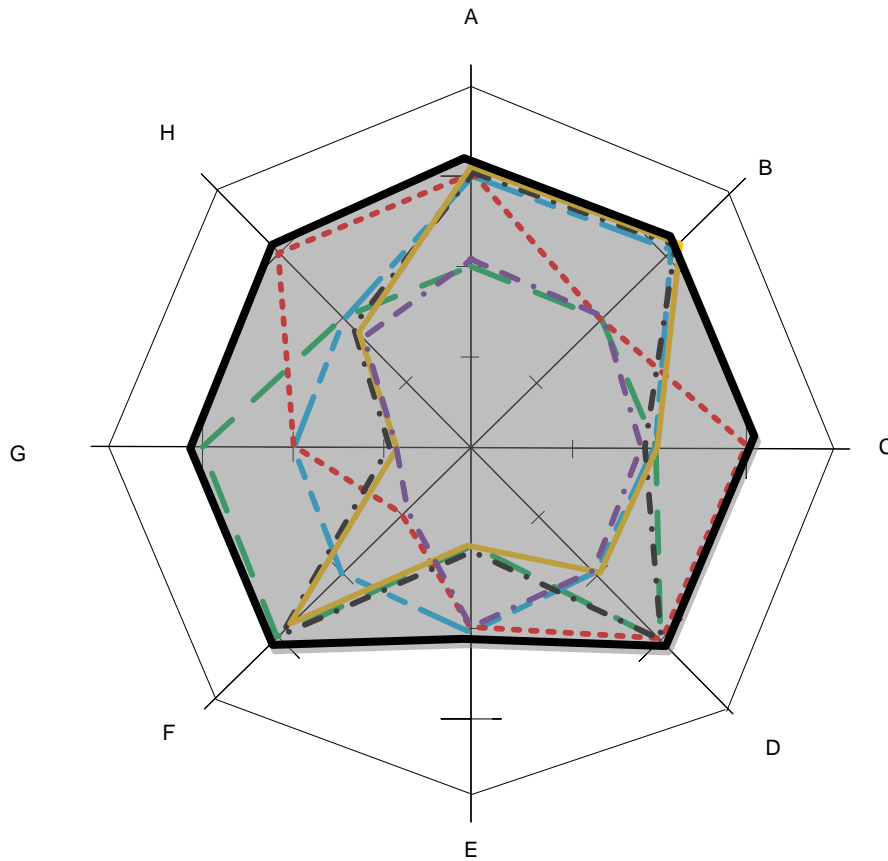
potential to either specialize or develop into a more integrated logistics centre with a larger scope and higher level of services.

The cluster 2 shows a hint of evolution process from specialization in transport and logistics to incorporate free trade concept which is the most evident difference. The incremental development of services can also be exemplified through modes of transport, and value added services. The inland intermodal hub is similar to an intermodal terminal/inland port but the concept of a hub implies that it is part of a wider network (United Nations, 2008), which also corresponds to a dry port definition depending on the scale and scope.

The distripark concepts can be used as an example to illustrate the evolution process. Although it is categorized in cluster 2, it could also fit in cluster 3 because it indicates a transition process between these two clusters based on the scale and scope of the offered services. Distripark provides services on an international scale. The value added services, as well as the custom and administration services are developed at an advanced level, whereas commercial and public services and marketing service is limited. Comparing to distripark, dry port also facilitates international trade but with the focus on intermodality and TPL services. There are different levels in terms of dry port definitions; some define an advanced level where others are more basic. Therefore the concept can also be grouped to cluster 2 depending on the level of development.

Free trade zone has advantages in providing value added services and convenient custom and administration services with an international perspective, but the rest of the aspects are relatively less developed, such as transport and logistics related services.

In the cluster 3, the definition of freight village indicates that it is a more comprehensive logistics centre with the strengths in geographic coverage, and transport modes. Notteboom and Rodrigue (2009) regard freight villages as logistics zones comprising intermodal terminals and logistics sites. The definition of freight village is very close to the definition of logistics centre, but there is a slight difference: Europlatforms defines the freight village *'is imperative to be run by a single body, either public or private'*. However, logistics centre has to be run by *'a single and neutral legal body, preferably by a PPP set-up'* (NeLoc, 2003, p 6). According to Tsamboulas, et.al. (1999), a freight village is *'an integrator of various transport modes, able to promote intermodal transport and does mainly an intermodal terminal, which is the principal component of the intermodal transport chain, constitute the node where the transshipment of goods from one mode to the other takes place'*. However, it was quoted in Meidute (2005) as one of the definitions of logistics centre, which indicate that logistics centres and freight village are to a great extent interchangeable (cf. Meidute, 2007) (Rimiene & Grundey 2007).



Legend	Concepts	A	B	C	D	E	F	G	H
— · — · — · — · — · — · — · — ·	Transport Centre	2	2	2	2	2	1	1	2
— · — · — · — · — · — · — · — ·	Logistics Park	2	2	2	3	1	3	3	2
— · — · — · — · — · — · — · — ·	Dry Port	3	3	2	2	2	3	1	2
— · — · — · — · — · — · — · — ·	Freight Village	3	3	2	2	2	2	2	2
— · — · — · — · — · — · — · — ·	GVZ	3	2	3	3	2	1	2	3
— · — · — · — · — · — · — · — ·	International Distribution Centre	3	3	2	3	1	3	1	2

Figure 4. Cluster 3

There are local, regional, and international distribution centres which provide different scale and scope of services and have different levels of importance in logistics systems. Therefore the geographic coverage also indicates diversity and complexity. Since these attributes are related to a certain geographic coverage, the geographic coverage should expand as other attributes are improved. One interesting point is that as the development of supply chains and related logistics networks, sometimes different terms can change the role and be more align with each other. For example, Rodrigue & Notteboom (2008) introduce the concept of terminalisation and find out that the role of inland terminals are developing as extended distribution centres in response to specific customer and market requirements that arouse increasing differentiation of supply chains and related logistics networks.

Furthermore, a term sometimes has various definitions that emphasize on different aspects and serves for diverse research purposes. For example, distribution centre can be virtually synonymous with warehouse, but some authors stress the product flow and rapid movements of goods (Bowersox, D. 1968), some focus on the value-added services, some emphasize order-fulfilment (Lu, & C Yang 2006), others take it as a transport and logistics centre (C. Reynaud, et al. 1987). The different emphasizes could be caused by the redefining and repositioning process of a concept that can serve up to the changes in practice. Regarding the definition of intermodal freight centre, it refers to “*the use of two or more modes of transportation in moving a shipment from its origin to its destination, commonly taking place at a terminal specifically designed for such a purpose*”. (Bardi et al. 2006) According to Woxenius et al. (2003), “*the most ambitious type of terminal is often referred to as intermodal freight transport centre or GVZ for Güterverkehrszentrum in Germany.*” It shows that the intermodal freight centre definition only stress the fundamental aspect which is a transfer point equipped for the transshipment and storage of intermodal transport units, but the advanced type GVZ requires more than that, such as all activities relating to transport, storage, and the distribution of goods both for national and international transit but also production, synergy effects, environmental friendliness etc. (Vedenpää, T et. al., 2002; Wienberg, L, 2002) Logistics centres store a wider mix of products at different points in the supply chain whereas distribution centre in a lot of cases serve as storage of finished or semi-finished goods close to final customers. Some of the logistics centres evolve by adding on the attributes of logistics centres, for example, a distribution centre can be collocated at a logistics centre, in which case it constitutes one of the operators of a logistics centre, as owner or tenant of such a facility (Rimiene, K et al. 2007). Nevertheless, the focuses in common are transport and logistics infrastructures and services, as well as intermodality. But the development of the other aspects depends on the economical, political, and social environment resulting in logistics centres with different characteristics.

To sum up, cluster 1 is more focused on transportation and logistics activities and there is limited development on additional functions that are not related directly to these activities. Cluster 2 have features similar to what would be expected out of an international trade centre. This cluster acts as a trade facilitator with customs clearance functionality and a strong focus on value added services. Cluster 3 is the comprehensive logistics centre that is yet the most advanced which covers the most functions both to variety and to the extent to which these services are offered. However it is also the cluster with the most differences between the terms.

The differences between each cluster are not limited to the eight attributes but the results shed some light on different development focuses. It indicates that there are some logistics centres specialize in transportation and logistics activities, but there is also another trend towards more comprehensive services such as public and commercial services, more effective marketing services, and more complex value-added services. One may speculate that the differences could be that the grounding purpose of logistics centre is based either on logistics and transport oriented (normally develop from terminal function) or on the trade and industrial development (normally develop from the functions of free trade zones or industrial park respectively). The development directions for logistics centre are either specialization in

trade development/logistic and transport services, or comprehensive development. Intermodality development is one of the major trends in logistics centres, as the charts show, only industrial park, free trade zone, and inland clearance depot have not developed the intermodal transport and with very limited logistics services. Sustainability and environmental performance of transportation and logistics could be one of the driving –forces for increased intermodality and modal shift. The three clusters are labelled and described as follows:

- **Cluster 1: Specialization in Logistics and Cargo Handling**, these centres and concepts are mainly concerned with cargo handling and transshipment, multimodal transportation, consolidation and distribution. However, the radar charts indicate that the public and commercial services, as well as marketing services are under development. This type of logistics centres is often transshipment-oriented. It is usually located close to air/sea/land hubs and transship large amount of international goods to different regions through intermodal transportation.
- **Cluster 2: Dedicated for Production and Trade Development**, the primary purpose of this type of logistics centres and concepts is to stimulate regional economic growth. This is achieved not only by strong logistics capabilities, but also offering low or no custom duties as well as other beneficial policies to facilitate trade. It usually relies on large trade and commerce markets to provide consolidation, distribution, transportation, storage, processing and value added services.
- **Cluster 3: Comprehensive services in regards to business and logistics and/or community development**, these centres and concepts usually offer a wide span of services to handle international traffic and related services. They usually have public-private ownership. To some extent it is a combination of the other clusters; the centre supports economic/regional development and it also facilitates the flow on the supply chains with the assistance of agents that provide supporting services such as financial arrangement, IT services, custom clearance, import export documentation, and integrated logistics solutions etc. Furthermore the served region not only attract many logistics related service providers, but also supports other business such as banking, retail stores etc that can be used to serve the community as a whole. Some of the logistics centres collocate with commerce and technology park nearby the logistics centre to attract investment, cargo traffic and improve technology development of logistics and transportation. Furthermore, there should be necessary handling facilities available for consolidation and distribution, modal shift and storage of various goods. Examples of these centres are freight villages and GVZ.

One of the likely reasons for the lack of consensus on the definition of logistics centre is the influence of an evolution process which is illustrated in the following section.

THE EVOLUTION PROCESS OF INTERNATIONAL LOGISTICS CENTRE

Logistics Centres can be categorized at different geographic levels. In respect of the geographical dimension, logistics centres are categorized into local, regional, and

international, in a spatially expanding sequence. This way corresponds to the scale of spatial organization for transportation developed by Rodrigue et al. (Rodrigue, Comtios et al. 2006). The factors that correspond to these spatial dimension and scale are area, within a country/intra-continent, and inter-continent/global respectively. A local area is a region within a country whereas a region is a group of local areas in the vicinity. (The World Bank, 2009) At the local level, logistics centres focus on domestic market in a national boundary rather than overseas market across borders. A region acts as part of a wider network to achieve national or continental coverage comparing to an area at the local level. A region has a scale of more than local but limited to continental level, which means it can be within a country, or cover one or more countries in one continent. Continents are divided by borders and regarded as groupings of countries based on geographic proximity which is the most important criterion. According to Bergqvist (2007), the natural neighbourhood in a region provides the advantages in both geographic dependencies and geographic transaction costs to form systemic setting of logistics supply chains.', which also applies to a country and continent. The concept of 'International level' in this paper means that the direct trade lanes are not only established within a continent, but also connected on an inter-continental level. According to Branch, International logistics operator in designing the supply chain permeates several countries and may extend to several thousand miles from Australia/China/India/Malaysia to Europe and North America and vice versa. (Branch A, 2008) The international level indicates that the logistics centre has a certain degree of international goods by both sea and air, meaning that it is a focal node for logistics flows between an intra-continental hinterland and one or several intercontinental regions. ILC acts as the transfer/ exit of international merchandise trade intra-continentially and inter-continentially, linking the local-, regional- and international markets. Based on this understanding, logistics centres at different levels can be distinguished.

In order to better understand and to define the concept of ILC, the evolution process is conceptually illustrated as a stepwise process that is three dimensional, in scope, scale and time. Between each stage there are some requirements to fulfil in order to reach the next stage. These requirements are summarized in Figure 5 of the evolution process.

According to this concept, a logistics centre may develop over time in two dimensions, scale and scope. Scale represents the level of specialisation and scope relates to the scope of services offers. By this definition the area of each stage represents the scope, and the depth represents the scale, combined the volume of each stage represent how developed the logistics centre is given the stage it is in.

Stage 1: "Functionality" corresponds to the characteristics of cluster 1 with a clear focus on logistics functionality, i.e. cargo handling, consolidation or distribution etc. These centres are usually transshipment oriented or located close to air/sea/land hubs and tranship large amount of international goods to different regions mainly by intermodal transportation. An example can be the Port of Singapore which is the world biggest transshipment hub. It is important that the administrative and transactional functions are developed to enhance functionality of logistics centre.

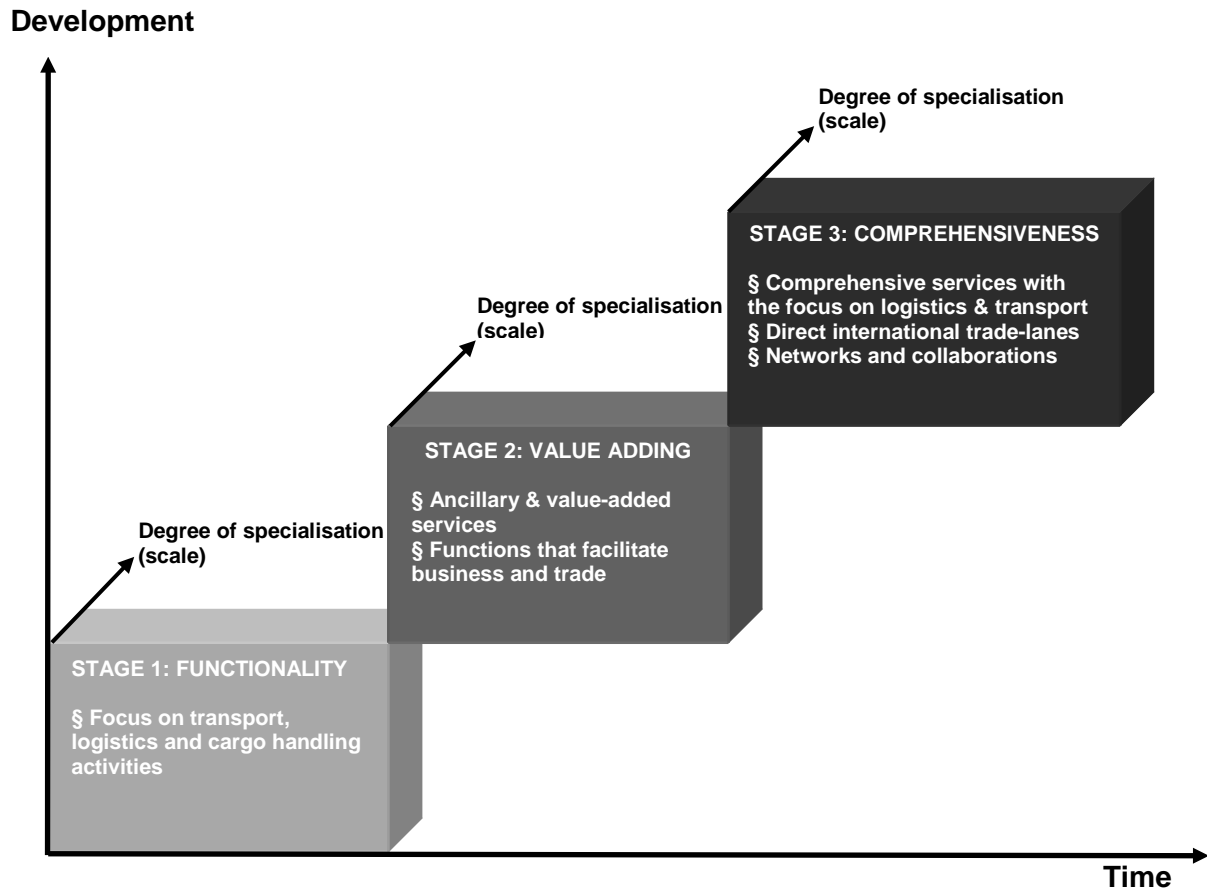


Figure 5. The Evolution Process of International Logistics Centre

Stage 2: “Value adding” has some similarities to cluster 2 where value adding activities are a strong characteristic. The main purpose in this stage is to stimulate regional economic growth by implementing business friendly policies that help to cut red tape and facilitate trade. These types of centres usually rely on large trade and commerce markets as the base for other value added activities such as goods processing, procurement and vendor management, customer service functions and so on. For example, the Shangdong Gaijiagou Logistics Park is developing at this stage. The business and trade development facilitates the prosperity of transport and logistics involving household appliances, daily chemical, medicine, hardware, machinery and electronics, as well as agricultural products.

Stage 3: “Comprehensiveness”, besides having all the characteristics of the previous two stages it has further developed its position as an recognized multifunctional node for international trade flows by establishing numerous international and inter-continental transport services. A wide span of services are normally offered in order to handle huge international transport volumes, the primarily goal at this stage is to facilitate the flow on the supply chain with the assistance of an array of different agents providing supporting and complementary services. Integration with customers’ supply chain and intermodality development to improve the environmental performance is also one of the features at this stage. Following the development, the services offered are not only limited to the transport sector but can also include other sectors such as financial institutions, research institutions

and other business activities that support the community as a whole. The region of Hongkong and Shenzhen is developing at this stage. As the development of port regionalization and hinterland connection, there is a decoupling process between knowledge-based supply chain management and physical movement of goods, which are referred as virtual logistics centre and physical logistics centre respectively. Therefore there are trends that some of the hubs evolve to 'knowledge based global supply chain centre' (GSCMC), others become 'international goods movement centre' (IGMC). (Wang and Cheng 2010) Combined, they are regarded as ILCs but each of them specializes on different aspects, e.g. at virtual level or operational level. The physical flows, information flows, and financial flows are all important to drive a region to evolve to ILC.

In general, the evolution process has some similarities corresponding to the product/market growth matrix (Aaker, D. 2007). All in all, the concept of ILC can only be understood by looking at the evolution process as a whole, with both the growth and risk embedded.

CONCLUDING REMARKS

The scope of ILC is expanding both geographically and by offered services. In the future, networking and collaborating with other centres is one of the most important directions that can sustain the competitiveness of logistics centres and provide more value to the users. This trend is captured by many researchers, for instance, Rodrigue and Notteboom (2008) introduced the term logistics pole which means a network consisting of several logistics zones and it is developed from interaction between seaports and inland locations to form a regional load centre network. Seaports act as the central nodes driving the dynamics in such a large logistics pole whereas inland ports/distribution centre can enhance the attractiveness of the seaport though expanding the hinterland reach of the port. Heaver (1993) stresses that terminals rather than ports are adversaries in the competitive struggle between ports, which means that hinterland network, as well as cooperation and collaboration among seaports and inland locations are one of the decisive factors for the competitive advantage. The paper suggests that the network dynamism is not only between ports and inland locations, but also among logistics centres. It also helps to harmonize service standards between logistics centres, and supports the development of economic and logistics performance.

There is a potential for logistics centres to develop their value added services (cf. Rimiene, K et al. 2007). As logistics centres evolve and expand, development through collaboration and networking becomes increasingly important to facilitate creativity and sustain long-term attractiveness and competitiveness. The administrative and transactional functions have to be updated to support the evolution process. As logistics centres evolve so does the marketing and promotion mix. Since a more evolved logistics centres incorporates more actors and systems, the marketing arguments elaborates on other factors than merely infrastructure, functionality, and services. Marketing and communication is also developed based on the economic, political, and social environment, industry involvement, academia, intermodality, and environmental aspects, etc. However, there is great homogeneity in the way regions market themselves, so how logistics centres differentiate themselves and

highlight the strengths and opportunities to attract business and investment is one of the focus for the future.

Based on the analysis of the different clusters and the evolution process of logistics centres, the following definition of ILC is proposed:

“An international logistics centre is a functional logistics centre offering its customers a full range of logistics value adding services together with facilitating transactional services and having direct access to global transport networks.”

It is important that an ILC has direct access to global transport networks because it enables direct transshipment of goods without the need of going through an intermediary location. Preferably an ILC should have direct access to inter-continental transportation systems. The direct access implies ILC can attract large transport volumes going through the ILC. This would also put additional requirements on various operators and logistics facilities, such as facilitating transactional services, improving capability to serve a variety of transport modes (intermodality) on a commercial basis in order to handle the large volumes of goods. ILC is usually reliant on well-developed public-private collaboration and the management is preferably a neutral legal body with good third-party access. It should support tenants' economical and productive performance in the transportation system. The service standard and quality performance has to be met for global commercial and sustainable transport solutions. ILC shares the characteristics of the three clusters, but it should be regarded as an evolving process that allows for specialization and diversification.

REFERENCES

- Aaker, D.A. (2007) Strategic Market Management, John Wiley & Sons, Inc, USA
- Ballis, A. (2004). "Introducing level-of-service standards for intermodal freight terminals." *Transportation Research Record* 1873: 79-88.
- Bardi, E.J; Coyle, J; and Novack, R.A. (2006) Management of Transportation, 7th edition, South-Western, Thomson, USA
- Bentzen, K; Hoffmann, T; Bentzen, L. (2003) Best practice handbook for logistics centers in the Baltic Sea region, NeLoc.
- Beresford, A.K.C., Dubey, R.C. (1990) Handbook on the Management and Operation of Dry Ports. Uncad, Geneva.
- Bergqvist, R. (2007) Studies in Regional Logistics – the context of public-private collaboration and road-rail intermodality, BAS Publishing, Göteborg, Sweden.
- Bichou, K. and R. Gray (2005). "A critical review of conventional terminology for classifying seaports." *Transportation Research Part A: Policy and Practice* 39(1): 75-92.
- Bowersox, D. E.W. Smykay, B.J. (1968) Physical Distribution Management. Logistics Problems of the Firm New York: The Macmillan Company.
- Branch, A. E. (2009) Global Supply Chain Management and International Logistics, Routledge, New York.
- Calderón-Calderón, B; Ruiz-Valdepeñas, H.P; Pastor Antolín, L-J. (2005) Oportunidad y problemática de las infraestructuras logísticas en ámbitos urbanos: el caso de Valladolid. *Ciudad y Territorio Estudios Territoriales*, vol XXXVII (143), 2005 p 145-168.
- Cardebring, P.W. and Warnecke, C. (1995) Combi-terminal and Intermodal Freight Centre Development, KFB-Swedish Transport and Communication Research Board, Stockholm.
- Cavinato, J, L. (1989) Transportation-Logistics Dictionary, 3rd ed. International Thomson Transport Press, Washington.
- Cerreno, A. L. C.; Shin, H; Strauss-Wieder, A; Thepfanis, S. (2008) Feasibility of Freight Villages in the NYMTC Region, New York Metropolitan Transportation Council.
- Christopher, M., (2004), *Logistics and Supply Chain Management: Strategies for reducing costs and improving service*, Second Edition, Pitman Publishing, London
- Corry, P. and Kozan, E. (2007) Optimised loading patterns for intermodal trains. Springer-Daugherty, P. J; Ellinger A. E., & Craig G., M. (1996) Integrated logistics: achieving logistics performance improvements, research paper
- De Cerreno. A.L.C; Shin. H.S; Strauss-Wieder, A; Theofanis, S. (2008) Feasibility of Freight Villages in the NYMTC Region, prepared for New York Metropolitan Transportation Council, Rutgers, Center for Advanced Infrastructure and Transportation, the State University of New Jersey.
- De Koster, M.B.M; Warffemius, P.M.J. (2005) American, Asian and 3PL international warehouse operations in Europe: a performance comparison, *International Journal of Operations and Production Management*, Vol 25, Issue: 8, pp 762-780.

- Economic Commission for Europe, (2001) Terminology on Combined Transport, United Nations, New York and Geneva.
- Economic Commission for Europe. (1998) UN/LOCODE – Code for Ports and other Locations, Recommendation 16, Geneva.
- EEIG, E. (2004) Logistics centres, Directions for Use, Europlatform.
- Ekenstedt, Li L. (2004) Decision Processes and Determinants of Logistics Facility Locations- Multinational Corporations' Perspectives, Logistics and Transport Department, School of Business, Economics and Law, Göteborg University.
- Gambardella, L.M; Mastrolilli, M; Rizzoli, A.E; and Zaffalon, M.(2001) An optimization methodology for intermodal terminal management, *Journal of Intelligent Manufacturing*, 12, 521-534.
- Gopal, C and Cypress, H. (1993) *Integrated Distribution Management*, Irwin, Boston.
- Hamzeh, F; Tommelein, I. D; Ballard, G; & Kaminsky, P. (2007). *Logistics Centers to Support Project based production in the construction industry*.
- Hanappe, P. (1986) *Plates-formes logistiques, centres de logistigue, ports secs*, Recherche Transports Securite, UNECE, Decembre 1986.
- Harrison R; Prozzi, J; McCray, J; and Henk R. (2002) *Impacts of Inland Ports on Trade Flows and Transportation in Texas: A Summary*, Centre for Transportation Research, University of Texas.
- Höltgen, D (1995) *Terminals, intermodal logistics centres and European infrastructure policy*, Doctoral Thesis, European Centre for Infrastructure Studies.
- Jaržemskis and Vasiliauskas (2007) *Research on Dry Port Concept as Intermodal Node*, Vol XXII, No 3, p 207-213.
- Jensen, A. (2005) *Trade Facilitation and International Logistics Performance*, School of Business, Economics and Law, Logistics and Transport Research Group, Göteborg University, Sweden
- Jensen, A. (2008) *Designing Intermodal Transport Systems: A Conceptual and Methodological Framework*, In R.Konings et. al. (ed.), *The Future of Intermodal Freight Transport*, Cheltenham UK: Edward Elgar.
- Johannsen, H, H & Kristiansen, J. (2007) *Analysis of Institutional and Organizational Solutions in the Development of Transport and Logistics Centres – based on illustrative examples*, Annexes 3.2.2 to the final report.
- Johnson, J, C, and Wood D, F. (1996), *Contemporary Logistics, USA*, Prentice-Hall International, Inc.
- Kabashkin, I. (2006) *Logistics Centres Development: Case Study Of Latvia*.
- Kia, M; Shayan, E;. Ghotb F. (2003) *Positive Impact of Distribution Centres on the Environment*, *Transport Reviews*, Vol. 23, No 1, p.105-122.
- Kondratowicz, L. (2003) *Planing of Logistics Centres, final report*, *Networking Logistics Centres in the Baltic Sea Region (NeLoc)*, Department of Scientific Publications of the Maritime Institute in Gdansk, Vol. 1, pp 133.
- Lee, S.W.K, and Ho, C. (2006) *Performance Evaluation of Asian Port Distriparks Using Factor Analysis*, *Korean Maritime Institute. Ocean Policy Research*, Vol. 21. No 1.
- Lingaitis, F. (2003) *Investigation of the possibility to establish a logistics centre in Vilnius Region and its potential benefits*, conference paper for *RelStat 03*, Vol. 5, No1.

- Lu, C and Yang, C. (2006) Evaluating Key Logistics Capabilities for International Distribution Center Operators in Taiwan. *Transportation Journal*, Vol. 45, No 4, p. 9-27.
- Lu, C. (2004) An Evaluation of Logistics Services' Requirements of International Distribution Centers in Taiwan, *Transportation Journal*, Vol. 43, No 4, p. 53-66.
- Lynagh, P. M. (1971) Measuring Distribution Center Effectiveness, *Transportation Journal*, , Vol. 11, Issue 2, p. 21-33.
- Meidute, I. (2005) Comparative Analysis of the Definition of Logistics Centres, *Transport Vol XX*, No 3, pp
- Meidute, I. (2007) Economical Evaluation of Logistics Centres Establishment, *Transport*, Vol XXII, No 2, pp111-117
- Ng, A. Y. and G. C. Gujar (2009). "Government policies, efficiency and competitiveness: The case of dry ports in India." *Transport Policy* 16(5): 232-239.
- Ng, K.Y.A & Gujar, G.C (2009) The spatial characteristics of inland transport hubs: evidences from Southern India, *Journal of Transport Geography*, Vol. 17, No. 5, pp. 346-356.
- Nijdam, M.H; Van der Lugt, L.M (2005) The changing nature of logistics centres: implications for ports and terminals, Erasmus University Rotterdam.
- Notteboom, T and Rodrigue, J.P (2005), *Inland Terminals within North American and European Supply Chains. Dry Port Development in Asia and other Regions: Theory and Practice*, United Nations Economic and Social Commission for Asia and the Pacific. Draft Version, 28 March 2009
- Notteboom, T and Rodrigue, J.P (2009) The Terminalization of Supply Chains: reassessing the role of terminals in port/hinterland logistical relationships.
- Notteboom, T. and J. Rodrigue (2005). "Inland Terminals within North American and European Supply Chains." *Development of Dry Ports*: 1.
- Pfohl, H.C & Gareis, K. (2005) Supplier parks in the German automotive industry: A critical comparison with similar concepts, *International Journal of Physical Distribution & Logistics Management*. Vol. 35 Issue 5,P 302 – 317
- Porter, M. (2001). "Regions and the new economics of competition." *Global City-Regions*: 139-157.
- Porter, M.E. (1985) *Competitive Advantage*, Free Press, New York, 1985.
- Reynaud, C and Gouvernal, E (1987), *Monitoring Systems for Goods Transport*. European Conference of Ministers of Transport: Round Table 74. Paris: ECMT, p. 5-50.
- Ricci, A. and Black, I. (2005) The Social Costs of Intermodal Freight Transport, *Measuring the Marginal Social Cost of Transport*, *Research in Transportation Economics*, Vol. 14, 245-285.
- Rimienne K and Grundey, D. (2007), *Logistics Centre Concept through Evolution and Definition*, *Engineering Economics* 2007 No 4 (54)
- Rodrigue J.P & Notteboom T. (2008) The terminalization of supply chains: reassessing the role of terminals in port/hinterland logistical relationships. ITMMA.
- Roso, V. (2005) The dry port concept – applications in Sweden, *Proceedings of Logistics Research Network*, Plymouth: International Logistics and Supply Chain Management.
- Roso, V., Woxenius, J. and Lumsden. K (2009) The dry port concept: connecting container seaports with the hinterland, *Journal of Transport Geography*, Vol. 17, No. 5, pp. 338-345.

- Rushton, A.; Croucher, P; Baker, P. (2006) *The Handbook of Logistics and Distribution Management*, 3rd edition, Glasgow: Bell & Bain. Slack, B (1990) *Intermodal Transportation*, Concordia University, Montreal, p75 in UNESCAP (2006) *Logistics Sector Developments: Planning Models for Enterprises and Logistics Clusters*, Economic and Social Commission for Asia and the Pacific.
- Sheffi, Y. (1990) *Third Party Logistics: present and future prospects*, *Journal of Business Logistics*; 11(2): 27-39
- Stefansson, G. (2004) *Collaborative Logistics Management, The role of third-party service providers and the enabling information systems architecture*, Department of Logistics and Transportation, School of Technology Management and Economics, Chalmers University of Technology, Göteborg, Sweden, p 206-220
- Teng, J.Y; Lee, K.L; and Huang, W.C (2007) *A Fuzzy Multicriterion Q-Analysis Model For International Logistic-Park Location Selection*, *Journal of Marine Science and Technology*, Vol. 15, No. 2, pp. 89-103
- Teo, Ch. P. (2001) *Impact on Inventory Costs with Consolidation of Distribution Centers*, Ch. P. Teo, O. Jihong, M. Goh, *IIE Transactions*, Vol. 33, p. 99-110.
- The World Bank (2009) *World Development Report 2009, Reshaping Economic Geography*, Washington DC, p 33-39
- Tsamboulas, D. and S. Kapros (2003). "Freight village evaluation under uncertainty with public and private financing." *Transport Policy* 10(2): 141-156.
- Tsamboulas, D. A; & Dimitropoulos I. (1999) *Appraisal of investments in European nodal centres for goods – freight villages: a comparative analysis*, *Transportation* 26:381-398, 1999.
- UNECE (2001) *UN Economic Commission for Europe*, p 56 in Roso, Violeta; Woxenius, Johan; Olandersson Göran (2006) *Organisation of Swedish Dry Port Terminals*, Division of Logistics and Transportation, Göteborg, Sweden
- UNESCAP (2006) *Logistics Sector Developments: Planning Models for Enterprises and Logistics Clusters*, Economic and Social Commission for Asia and the Pacific, p. 2
- United Nations, (2002). *Commercial Development of Regional Ports as Logistics Centres*, Economic and Social Commission for Asia and the Pacific. New York, 98 p.
- United Nations, Economic and Social Commission for Asia and the Pacific. (2002) *Commercial Development of Regional Ports as Logistics Centres*, New York, 98 p.
- Vedenpää, T; Noponen, J; Heilala, A-J; Meronen, J; Rasimus, M (2002) *Logistics of Electronic Business; the International Preparation of the Technology Program Study in Germany*, eLo Germany Verlag, November 24.
- Walter C.K and Poist R. F. (2004) *North American inland port development: international vs domestic shipper preferences*, *International Journal of Physical Distribution & Logistics Management*. Vol 34 Issue 7 P 579 – 597.
- Wang, J. J. and M. C. Cheng (2010). "From a hub port city to a global supply chain management center: a case study of Hong Kong." *Journal of Transport Geography* **18**(1): 104-115.
- Wiegmans, BW; Masurel, E; Nijkamp P (1998) *Intermodal freight terminals: an analysis of the terminal market*, Research Memorandum.

- Woxenius, J. (1997) Terminals – A Barrier for Intermodality?, presented at Nordic Transport Research's Conference on Intermodal Freight Transport, Ebeltoft, Denmark, 22-23 September, 1997.
- Woxenius, J; Roso, V; Lumsden, K. (2004) The Dry Port Concept – Connecting Seaports with their Hinterland by Rail, Department of Logistics and Transportation, Chalmers University of Technology
- Zhu, J (2000) The impact of industrial land use policy on industrial change, Land use policy Vol. 17. p 21-28

INTERNET

- Europlatform's official definition website, URL :<http://www.freight-village.com/definition.php>
[accessed on 2009-10-20]
- Jetro website, URL: www.jetro.go.jp [accessed on 2009-11-21]
- NTU Website, URL: <http://www.ntu.eu/idn20.asp> [accessed on 2009-12-15]
- Sutranet, Transport and logistics centers website, URL: http://www.isl.org/projects/project.php?lang=en&proj_num=1320&proj_sub_num=1 [accessed on 2009-10-12]

APPENDIX

Appendix 1 The Criteria for Grading Third Party Logistics Services

	Basic	Intermediate	Advanced
Physical Services	<ul style="list-style-type: none"> • Storage • Good reception • Picking according to order • Packaging • Repackaging & labeling • Return of goods • Delivery from storage 	<ul style="list-style-type: none"> • Consolidation • Deconsolidation • Preparation for freezing • Freezing, thawing, sawing • Preparation for delivery & packaging • Setting building, sequencing, product resorting and labeling • Cross-docking 	<ul style="list-style-type: none"> • Assembly of components • Operate vendor management inventories in stores or stock-keeping facilities • Recycling with waste handling & reconditioning • Unpacking & quality control
Administrative Services	<ul style="list-style-type: none"> • Tendering & contracting other LSP • Tendering & contracting carriers • Insurance services • Stock-taking 	<ul style="list-style-type: none"> • Payment services • Order administration & customer service • Claims handling • Export clearance & import clearance • Track-and-trace information 	<ul style="list-style-type: none"> • Forecasting & inventory management • Administration of minimum & protective inventories • Purchase & call-offs • Delivery planning, management & follow-up • Exception management

(Source: Gunnar Stefansson - Chalmers University of Technology, Sweden - 2005)

	Basic	Intermediate	Advanced
Physical Services	None	None	None
Administrative Services	<ul style="list-style-type: none"> • Tendering & contracting LSP companies • Tendering & contracting carriers • Insurance services 	<ul style="list-style-type: none"> • Forwarding services • Payment services • Financial services • Order administration & customer service • Claims handling • Export clearance and import clearance • Providing one-stop logistics service purchase • Track-and- trace information 	<ul style="list-style-type: none"> • Design of individual logistics setups • Implementation of logistics setups • Operation of customers' logistics setup • Responsible for the customers' logistics operations • Exception management

(Source: Gunnar Stefansson - Chalmers University of Technology, Sweden - 2005)

Appendix 2 The Criteria for Grading Value-added Services

Value-added Services		
1 Score	2 Score	3 Score
inventory management	adding parts	goods processing
order picking	maintenance and repair	semi-manufacturing
inspection, quality control	testing, installing, adding instruction manuals	final assembly
labeling, packaging, bar-coding,		reverse logistics
		Product customization