The changing strategic roles for warehousing in an emerging economy: case study in Ukraine

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Abstract: The increasing globalisation of the world economy is having a profound impact on logistics. Emerging economies are experiencing rapid developments that affect their warehousing facilities. The purpose of this study is to explore the strategic roles that warehousing plays and the changes therein. Based on a literature review, a new model has been developed in which changes in the strategic warehouse role depend on three primary location drivers and on site competence. Focusing on Ukraine, an emerging economy, data were collected through a desk study, questionnaires completed by international third-party logistics companies located in Ukraine and through in-depth expert interviews. The results show that the model developed is appropriate for use in the initial determination of a warehouse location and for its further development in an emerging economy.

Keywords: warehouse management; strategic roles; location drivers; emerging economy; Ukraine.

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1 Introduction

The spreading globalisation of world markets is making inroads into many countries, affecting their economic development. Logistics are experiencing changes in their structure as well as in operations. These changes are particularly perceptible in relatively closed markets. The liberalisation of trade and investments between Central and Eastern Europe (CEE) and the European Union (EU) has led to primary activities, such as purchasing, manufacturing and distribution, being relocated (Toubal, 2004). During the 1990s, several manufacturers and logistics service providers (LSPs) positioned themselves within what they saw as the most promising CEE countries.

Figure 1 Ukraine (see online version for colours)

Source: http://www.ukrainianwomen.net

Although it is not part of the extended EU, interest in Ukraine is also growing because it is an attractive transit country for goods to and from Europe, Asia and the Middle East. Following the 2004 enlargement of the EU, Ukraine now shares borders with four EU countries: Poland, Slovakia, Hungary and Romania (see Figure 1). Although Russia

remains Ukraine's largest single trading partner, a shift can be seen towards the European market. Attracted by low labour costs and the possibilities of exporting to other countries, many international companies are approaching Ukraine. International third-party logistics (3PL) providers also seek warehousing facilities in Ukraine that complement and extend their Pan-European supply chains.

Warehousing is defined by Grant et al. (2006, p.229) as "that part of a firm's logistics system that stores products (raw materials, parts, goods-in-process, finished goods) at and between point of origin and point of consumption". Following Bowersox et al. (2007), warehousing activities can be characterised by the *type* and the *sophistication* of these activities. The basic activity *types* are receiving, storing and shipping. These activities can be extended to include transfer, selection (pick and mix) and value-added services (VAS) to meet customer requirements. Examples of VAS are adding, removing, repackaging, labelling, air-conditioning and activities to complete the product. Also, activities linked to returning or recycling products can be seen as adding value. The level of *sophistication* of warehousing activities refers to the extent to which advanced technology and/or technological skills are used to carry out the above activities. In other words, it is the level of managerial and technical expertise used to support these activities.

In many developing countries, logistics are underdeveloped. The challenges in this respect result from inherited problems as well as from a "… lack of understanding of logistics' role and importance" (Razzaque, 1997). His findings from interviews and questionnaire (n = 68) result in five 'composite (factor-like) variables': infrastructure related problems, challenges posed by the economic system, management system problems, managerial problems, and general problems. He notes "… that these challenges are similar to those faced by other developing nations discussed in the literature survey."

Ukraine can be considered an emerging economy, defined as developing countries that have started an economic reform process aimed at alleviating problems such as poverty, poor infrastructure, overpopulation, and achieved a steady growth in gross national product (GNP) per capita (Cavusgil et al., 2002). Ukraine does not appear on common lists, see for example, the FTSE (2010) country classification. Its economy ranks 145 (of 183) in the IFC-World Bank (2010) list of ease of doing business. To provide a comparative perspective Table 1 presents the rankings for three topics of the doing business relevant for warehousing as well as the summary ease of doing business.

Table 1 'Doing business' selected rankings; range: 1–183

Topic	*Ukraine*	*Russia*	*Germany*	*USA*
Dealing with construction permits	179	182	18	27
Trading across borders	139	162	14	20
Enforcing contracts	43	18	6	8
Ease of doing business	145	123	22	5

Source: IFC-World Bank (2010)

Other indicators for Ukraine's development include:

- Human development index: rank 69 (of 169), which summarises life expectancy, years of schooling, and gross national income per capita (UNDP, 2010).
- Global competitiveness index 2010–2011: rank 89 (of 139) (WEF, 2010).

- Business sophistication 2010–2011 (one of the pillars of global competitiveness index): rank 100 (of 139) (WEF, 2010).
- 'Political stability no violence' 2009: score 34 (scale 0–100) (World Bank, 2010).
- 'Government effectiveness' 2009: score 24 (scale 0–100) (World Bank, 2010).

The purpose of this study is to explore the changing strategic roles of warehousing facilities in an emerging economy, focusing on companies located in Ukraine but acting on an international level. The outline of the study is as follows. First, a framework is developed based on a combination of the typology of warehouse roles proposed by Bowersox et al. (2007) and the concept of the 'strategic role of a factory' by Ferdows (1997). Following this, the research design is discussed. After an overview of developments in warehousing in the Ukrainian market, this study presents its findings, followed by a discussion. The conclusions address the suitability of the proposed model as well as the practical implications.

2 Conceptual framework

In this section, a model is developed based on the typology of warehouse roles proposed by Bowersox et al. (2007) and the concept of the 'strategic role of a factory' by Ferdows (1997). First, the typology of Bowersox and the concept of Ferdows is discussed. Subsequently, the model is presented.

2.1 A typology of warehousing roles

Bowersox et al. (2007) present various functionalities and roles of a warehouse with regard to economic and service benefits. First, *economic benefits* result from a warehouse when overall logistical costs are reduced by using such facilities. A warehouse can function as a *consolidating* warehouse: receiving and consolidating materials from a number of manufacturing plants destined for a specific customer in a single shipment. In this way, several potential shipments to a specific market area are combined into a single flow. Closely related to this function are warehouses that carry out 'break bulk' and 'cross-docking' activities. A *break bulk* warehouse receives merged multiple customer orders from single manufacturers and divides them up prior to shipping to individual customers. *Cross-docking* involves multiple manufacturers who ship their products to the warehouse, where the products are literally moved across the docking bay – there is no storage – to be loaded into trailers destined for the appropriate customers. Another warehouse operation can be the *postponement* function: after receiving a specific customer order, processing is completed by adding labels and finalising the packaging. Warehouses can also be used for *stockpiling*, providing an inventory buffer which allows production efficiencies to be gained within the constraints imposed by material sources and the customer.

Second, *service benefits* result from warehouses that are primarily justified on the basis of service, by improving the time and place capability of the overall logistical

system. The *spot stock* warehouse is one example: a stock spotting strategy involves warehousing a narrow product range, with stocks placed in a large number of small warehouses dedicated to specific markets for a limited time. In contrast, an *assortment* warehouse has a broad product line, is limited to a few strategic locations and functions all year round. The benefit of this approach is reducing the number of suppliers that a customer has to deal with. The *mixing* warehouse is somewhat similar to the break bulk concept: shipments from several manufacturers are unloaded at the mixing warehouse and the benefit comes from sorting this inventory to precise customer specifications. *Production support* warehouses are established to provide a steady supply of components and materials to assembly plants. Given long lead times and significant variations in usage, holding stocks is justified. Warehouses can enhance market share by highlighting the local *market presence* of a firm. This idea is based on the perception that local warehouses will be more responsive to customer needs by offering quicker delivery. For certain products, the quality and location density of the associated *service centre* network has become very important. *Reverse logistics centres* are dedicated to handling returns, surplus, scrap, waste and excess material products (Grant et al., 2006).

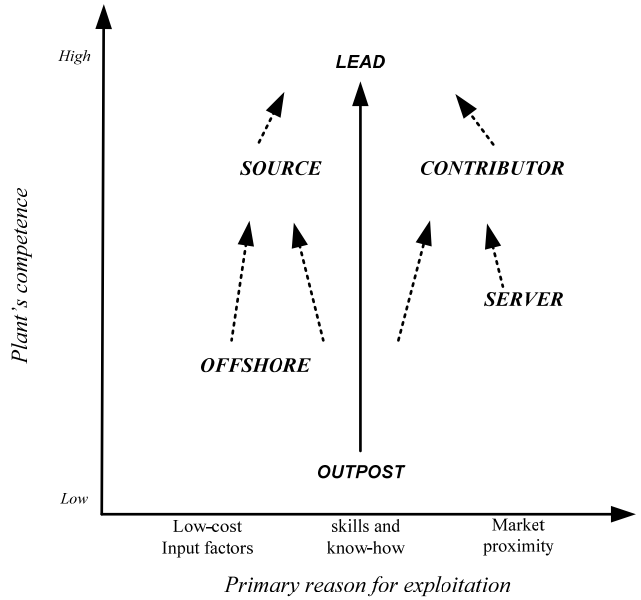
2.2 Strategic roles of factories

In order to provide an insight into how an international factory network could be designed, Ferdows (1997) introduced the concept of the 'strategic role of a factory'. This concept is based on two variables: 'primary location drivers' and 'site competence'. Ferdows distinguishes three 'primary location drivers' for establishing a factory: access to low cost input factors, access to skills and know-how, and proximity to market. 'Site competence' refers to the extent to which a selected set of activities, that go beyond simply producing goods, is present at the site. One speaks of a high site competence when, for example, process engineering, product customisation, after-sales service and product development are present. Combining these two variables (the three location drivers and high/low site competence) leads to six generic roles for an international factory, which can be grouped into three pairs with each a low resp. high site competence:

- *offshore* and *source* factories that provide access to low-cost inputs, usually labour
- *server* and *contributor* factories that are close to local markets and, therefore, enable high quality customer service
- *outpost* and *lead* factories that use local skills and know-how.

Ferdows (1997) uses these roles to track changing pattern in the strategic role of a *factory*. He describes a natural evolution of plants in the direction of increasing site competence. The upgrading of a plant's role requires systematic managerial attention. By definition, an offshore factory will evolve into a source factory if the site competence increases. Similarly, server and outpost factories can develop into contributor and lead factories respectively. Moreover, as illustrated in Figure 2, not only outpost factories but also contributor and source factories may become lead factories through increased site competence.

Figure 2 Strategic factory roles



Source: Ferdows (1997)

Ferdows (1997) argues that it is the combination of 'site competence' with one of the three 'primary location drivers' that identifies the contribution of a facility to the strategy of the firm it belongs to. Several researchers into international manufacturing have elaborated on Ferdows' strategic role concept including Meijboom and Vos (1997), Vereecke and Van Dierdonck (2002), Meijboom and Voordijk (2003), and Vereecke et al. (2006), seeing it as going beyond traditional one-dimensional efficiency-related (cost minimisation) considerations.

2.3 Combining warehousing typology and strategic roles

The various warehouse types, as described by Bowersox et al. (2007), can be combined with the strategic roles, as distinguished by Ferdows (1997), to provide a classification for the strategic roles of warehouses.

2.3.1 Primary location drivers and warehousing roles

Ferdows' (1997) *low cost input factors* are equally applicable to warehousing. Considering their characteristics, we see that the following types of warehouses are located close to low cost labour, cheap raw materials and/or cheap energy: consolidating, break bulk, stockpiling, assortment and production.

Ferdows' *proximity to market* concept is also relevant for warehousing. Increasingly, the rapid and reliable delivery of products, and their customisation according to customer requirements, are objectives of warehouses located close to the market. Emphasis is placed on the customer service level in the following types of warehouses: cross-docking, postponement, spot-stock, mixing, market presence, reverse logistics centre and service centre.

As the third primary reason for exploiting a location, Ferdows gives *skills and know-how*. Meijboom and Voordijk (2003) showed that the general environment is very important for attracting and keeping facilities that offer a high site competence. In particular, the transport infrastructure, the political/legal environment and the supply and quality of the labour market are important for facilities that offer high site competence. Warehouse facilities with a high site competence often share the site with the headquarters of the company and several other functions, such as R&D and marketing. For warehousing facilities requiring low site competence, skills and know-how are expected to be less important in the location decision process.

2.3.2 Site competence and warehousing roles

Site competence, the second dimension of Ferdows' framework, is redefined for this study as the extent to which specific activities that go beyond simply receiving, storing and/or shipping products are required at the site. Decisions about warehouse location should involve consideration of the required site competences for warehouses to operate effectively in their desired role. Ferdows (1997) qualifies site competence on a scale from low to high. One can apply this dimension to warehousing, distinguishing the same levels of site competence. In classifying warehouse types along this dimension, we have two types: those with *low* and those with *high site competence*.

A warehouse with low site competence is one that, in its purest form, functions as a break bulk, stock-piling or production support warehouse. The activities are basic, do not include a significant technical component and do not require considerable managerial attention (for example, by dealing with a single supplier). Although a cross-docking warehouse deals with multiple suppliers, the products move directly across the dock and so do not demand much technical support. This is also the case with warehouses operating a spot-stock function (narrow product line, not functional all year round) or a market presence function (focus on presence rather than type of activities).

Conversely, a high site competence is needed for consolidating and assortment warehouses since these require a relatively high level of technical and/or managerial attention. An assortment warehouse has a broad product line and needs to be strategically located. A consolidation warehouse deals with multiple suppliers and requires a well-structured approach if it is to compile single transportation shipments. Often, the use of technology can benefit these processes. In a postponement warehouse, value adding services are often performed. These activities need high levels of technical support in comparison to basic activities like stock holding. A reverse logistics centre is a relatively new concept and needs a tailor-made approach.

Combining the concepts of primary location drivers and site competences (Ferdows, 1997) with the characteristics of the mentioned warehouse types (Bowersox et al., 2007) leads to the preliminary model shown in Table 2.

From this model, it can be inferred that an increase or decrease in the number or type of activities does not necessarily result in a change in site competence, because these activities might not require a significant upgrade in technology or management. However, if the level of sophistication of current activities increases, or if extra activities that require a higher level of sophistication are added, the required site competence will increase. Changes in activities and/or sophistication level are believed to be caused, or at least strongly influenced, by international and national market developments.

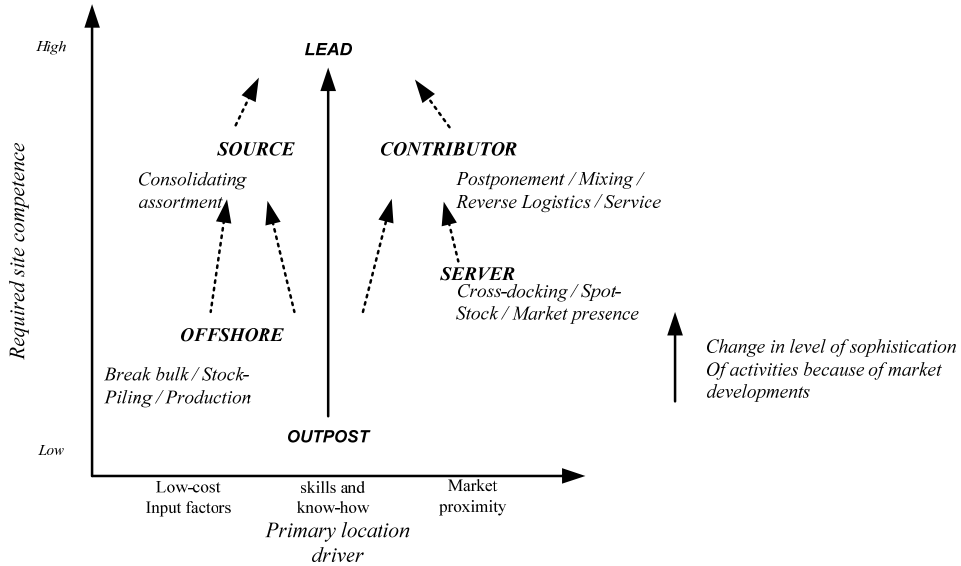
Table 2 Strategic warehouse roles

Primary location driver		*Access to low cost input factors*	*Access to skills and know-how*	*Proximity to market*
Site competence	High	Source	Lead	Contributor
		Assortment	Assortment	Mixing
		Consolidating	Consolidating	Postponement
			Mixing	Reverse logistics
			Postponement	Service
			Reverse logistics	
			Service	
	Low	Offshore	Outpost	Server
		Break bulk	Spot-stock	Cross-docking
		Production	Stockpiling	Market presence
		Stockpiling		Spot-stock

Source: Based on Ferdows (1997) and Bowersox et al. (2007)

With this theory in mind, a new model is developed based on Table 2. In this new model, each warehouse type is assigned a strategic role based on the activities of the warehouse in its purest form. In Figure 3, Ferdows' (1997) concept has been adapted, resulting in a new form.

Figure 3 The strategic roles of warehousing facilities



Source: Based on Ferdows (1997)

3 Research design

The research reported in this paper seeks to provide insights into the changing strategic roles of warehousing facilities in an emerging economy. In view of the exploratory nature of the research and the suggestion that qualitative methodological approaches "…get under the surface in order to understand people's perceptions and experiences" [Silverman, (2006), p.5], a qualitative methodology was adopted. As part of operationalising the above conceptual framework, in the form of a research plan, this section describes the development of a questionnaire as well as the data collection activities, i.e., a desk study, the collection of data from 3PL providers active in Ukraine using the questionnaire and in-depth expert interviews.

3.1 Developing a model-based questionnaire

The two important dimensions of the developed model – 'primary location driver' and 'site competence' of a warehouse – can be used to assess and predict the direction of change in the warehouse role as a consequence of market developments. To obtain insights into the direction of change, a questionnaire, consisting of four parts, was developed for LSPs in Ukraine. The first three parts focused on the primary location drivers plus the site competence and the types of warehouses in Western Europe, CEE and Ukraine. In order to address the expected developments, Part 4 focused on Ukraine and investigated perceived threats and opportunities for growth within the LSP industry in Ukraine.

3.1.1 Part 1: primary location drivers

The respondents were asked to indicate the *primary location drivers* behind establishing their services in Western Europe, in CEE and in Ukraine. The question needed to be answered for three points in time: 10 years ago (or the time of establishment if more recent); the present day; and what they expected their situation to be 10 years from now. The objective here was to gain insights into whether there are different primary location drivers for Ukraine than in Western Europe and CEE.

3.1.2 Part 2: site competence – services offered

The respondents were asked to indicate the *services offered* in Western Europe, in CEE and in Ukraine, from a list, and indicate the *level of sophistication* of these activities. If any of the suggested services were not offered, the respondent could indicate this. Further, respondents were asked to indicate whether a change in the level of sophistication was expected. The objective was to assess the breadth and level of sophistication of the services offered in Western Europe, CEE and Ukraine.

3.1.3 Part 3: site competence – warehouses types

Subsequently, the respondents were asked to list the *types of warehouse*, based on its main purpose, they were currently operating in Western Europe, in CEE and in Ukraine. The objective was to gain insights into the developments of various types of warehouses since this could have an influence on the warehouse roles included in the model.

3.1.4 Part 4: threats and opportunities

From the literature, we drew up a list of possible threats to and opportunities for growth in the 3PL industry in Ukraine, and respondents were asked to indicate which they saw as the most important. Space was also provided for the respondents to mention any other important factors we had overlooked. The objective here was to gain insights into the attractiveness of Ukraine for 3PL services.

3.2 Data collection activities

The analysis of the Ukrainian market for logistics services focused on developments in the real estate market for warehousing, the Ukrainian market for LSPs and the services provided by these LSPs. The results (presented in Section 4) are based on market reports by Collier International (2005), Inbound Logistics (2006) and Real Estate Ukraine (2006). This desk research was complemented with data from the questionnaires returned by 3PL providers active in Ukraine and from face-to-face interviews with experts.

We started with a list of the top one-hundred 3PL providers in the world (Inbound Logistics, 2006) and from this selected all the companies that seemed to be active in Ukraine. This selection was based on information on the companies' websites regarding their global networks. The list was supplemented with national Ukrainian companies which were identified from websites where available in English. From these sources, 25 potential respondents were identified (see Appendix), to each of whom a questionnaire was sent. This final list included leading LSPs, both in the European market and in the Ukrainian market.

The potential respondents were invited by e-mail to complete the questionnaire online. After two weeks, a reminder was sent and, after four weeks, the companies were approached by phone. If necessary, the questionnaire was resent with additional information about the purpose of the study. Of the 25 companies contacted, nine returned questionnaires. We found that the phone calls were crucial in the process of obtaining a response. The Ukrainian market is still reluctant to be very transparent, and most companies were not willing to cooperate for this or other reasons.

In addition to collecting data through the questionnaires to active 3PL providers in Ukraine, face-to-face interviews were held with the following five experts: a branch manager of an international LSP in Ukraine, the chief editor of the Ukrainian magazine 'distribution and logistics', a professor in supply chain management at the University in Kyiv, a senior consultant on warehousing and logistics in Ukraine and a director of a project management and consultancy agency bringing Dutch LSPs and Ukrainian partners together. These experts were selected because of their knowledge and experience with the Ukrainian logistics services market. Where appropriate, components of the questionnaire were also used in these expert interviews.

3.3 Data analysis

Data were collected and analysed concurrently (Merriam, 1988). The data from the survey were tabulated and grouped and presented in bar charts and pie charts, a selection of which is presented below. Data from the expert interviews provided many and varied details as "… the use of in-depth interviews enables a researcher to gain insights and

understanding of complex, sensitive issues or very personal topics" [Orhan and Scott, (2001), p.233].

4 The Ukrainian warehousing market

4.1 Warehousing real estate market

Warehousing as an economic activity in Ukraine has only developed over the last decade and tends to be concentrated around the capital Kyiv because of its central location and the presence of potential clients. Kyiv is the most developed city in Ukraine in terms of warehouse real estate [Real Estate Ukraine, (2006), p.36]. The economic development of Ukraine, with additional demand from large industrial and retail enterprises expanding their presence in the country, has resulted in a tendency to outsource logistics to 3PL providers, and the increasing scale of operations by logistics operators has pushed up demand for modern warehouses. Demand for quality warehouse premises outstrips supply, and this shortage is reflected in high rents. Although the real estate sector is developing, there remains a considerable shortage of suitable land plots and warehouses. This has led LSPs to develop their own warehouses and search for sites outside of Kyiv.

Most warehouse premises in Kyiv consist of reconstructed and old facilities in industrial zones. There are few large 'professional' warehouse premises and, in general, the quality is poor. The majority, 80% according to Real Estate Ukraine (2006, p.34), of the existing warehouses are simple storage centres that do not satisfy the requirements of Western LSPs. The development of new, modern warehouses continues to be limited due to a major shortage of land, closed and non-transparent land acquisition procedures, and a complex and time consuming process for gaining the necessary permits and documentation from local and state authorities (cf. expert interviews).

4.2 LSP market

Three international transport companies are already active in the Ukrainian logistics services market: the German Kuehne+Nagel, the French FM Logistic and the Dutch Frans Maas. Following in the footsteps of these firms, local LSPs are also increasingly paying attention to providing a good customer service and locating their warehouses close to the market. The tendency for Ukrainian manufacturers to outsource logistical activities to LSPs is growing, particularly because these firms have limited warehousing space.

The LSPs in Ukraine can be divided in three groups. The first group consists of local LSPs who are expanding their current services to meet the steadily increasing demands from their clients. Typically, these are either well established (with more than 10 years of experience) or are relatively young (with less than 5 years of experience). The second group encompasses the subsidiaries of international LSPs, who have established their own warehouses and networks due to a lack of suitable local partners. Today, they still only take up a small part of the market but, due to their experience and well-managed distribution structures, they are increasingly competing with the first group. The third group consists of company alliances between international and local LSPs and of once local LSPs that have been taken over by international LSPs.

Two waves of growth in the LSP market can be distinguished. The first wave was driven by the transport industry: as part of political and economic reform, transport companies started to offer additional logistics services besides transport. The second wave was led by the retailers: they are experienced in supermarket distribution, often work directly with manufacturers and have experience with, and the means to support, large loads. Such retailers are considered to be more flexible and quicker than the LSPs and, further, they have greater knowledge about the technology (cold storage for example) than LSPs.

4.3 Services provided

The services offered in the Ukrainian logistics market depend on the provider. If an LSP originated in the West, it tends to offer a complete range of services, comparable with what is offered in Western Europe. Given their wide use of various technologies, international LSPs can offer a higher level of customer service than local LSPs. In Ukraine, the number of LSPs offering a very wide range of services remains low. The growth of the logistics market over the past decade has encouraged some local LSPs to expand their national network and to extend their service portfolio. However, the services offered by local LSPs that lack a Western parent or sister organisation tend to remain fairly basic: storage (albeit at a good location), pallet handling, condition controlled storage, fire safety and order picking. Some do have warehouse management systems providing basic information.

Support in gaining customs clearance and VAS are widely offered, but the latter tend to be limited to packing, repacking, sorting and labelling products. Some offer consultancy or services linked to client-specific requirements. Online tracking and tracing and special client access are not offered by the local LSPs. It is worth noting that, in some cases, services such as ‘preparing product for promo-actions’ and ‘office/residential relocation’ are also offered, and some LSPs provide an overview of their fleet.

4.4 International comparison

The World Bank (Arvis et al., 2010) has published a report on the logistics performance index and its indicators, proposing a comprehensive approach to supply chain performance. The index is based on six areas of performance: customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing, timeliness. The relevance of logistics is underlined by a paper on economic growth that states that “… successful participation in the global economy will be increasingly determined by whether a country maintains high-quality, reliable trade infrastructure, …” (Ikenson, 2008).

The top three scoring countries are Germany (score 4.11), Singapore (score 4.09) and Sweden (score 4.08). Ukraine’s score is 2.57 (51% of the highest performer) and its rank is 102nd in a list of 155 countries (Somalia scoring 1.34 and ranking 155th). Ukraine has a higher rank (i.e., doing relatively better than its index) in infrastructure, international shipments and logistics quality and competence. However, it ranks lower in the other three areas, in particular customs.

Infrastructure, which includes warehousing, scored 2.44 and ranked 79th in 2009 in Ukraine, a level higher than the country average. In 2006, when data were collected for this research project, infrastructure scored 2.35 and ranked 74th, which was at a level

commensurate to Ukraine's logistics performance index, then ranking 73rd (Arvis et al., 2007).

4.5 Conclusions

The logistics market has grown rapidly over the past decade. Besides attracting foreign subsidiaries and alliances, this growth has also triggered local LSPs to expand their national network and extend their portfolio. A major restriction on this growth is, however, the considerable shortage of suitable plots and warehouses.

The international comparison demonstrates that the logistics performance index of Ukraine is moderate (half of the highest performer), though there is considerable variation across the six areas. Moreover, Ukraine's rank in the logistics performance index has dropped between 2006 and 2009 (from 73rd to 102nd). The infrastructure indicator, which includes warehousing, improved somewhat between 2006 and 2009, though its rank dropped five places, implying that it remained almost the same.

5 Company-level findings

The sections below present the data collected from 3PL providers active in Ukraine and experts on the Ukrainian market for logistics services.

5.1 Primary location drivers

Ten years ago, of the three suggested primary location drivers (see Figure 3), proximity to market was the most important motive for establishing warehouses in Western Europe. Today, both access to skills and know-how and access to low-cost input factors are as important as proximity to the market. In the future, proximity to market is once again expected to be the primary reason for establishing warehouses in Western Europe.

Ten years ago, in CEE, proximity to market was also considered to be the most important driver, but not as dominant as in Western Europe: access to skills and know-how was also seen as important. Both today and for the future, these two location drivers are seen as the primary reasons for establishing warehouses in CEE.

Turning to Ukraine, the proximity to the market is considered to be the primary location driver for establishing warehouses at all three points in time. The other drivers, access to low-cost input factors and to skills and know-how, do increase in importance over time, reducing the relative importance of proximity to market. The Ukraine picture differs from the CEE picture in that, in Ukraine, proximity to market is considered more important than it is in CEE at all three points in time.

In terms of developments over time, the picture for Ukraine shows a clear development in the relative importance of the primary location drivers: from a strong dominance of proximity to market to a more balanced significance. For CEE, the relative importance of the three drivers does not change much over the 20-year period considered. In terms of Western Europe, proximity to market was the major driver 10 years ago and is expected to be, by far, again 10 years from now. The availability of the know-how and skills required for warehouse operations in Western Europe is currently a significant

driver but it is assumed that these skills will become widely available and so cease to affect future warehouse location decisions.

5.2 Site competence – sophistication of services offered

In general, the sophistication of services offered in Western Europe is at a normal level. Modern services such as adding value, product recycling and reverse logistics are offered but only on a limited scale. The level of sophistication is expected to increase, although the expectation is that, 10 years from now, 'modern' services will still only be offered on a limited scale.

In CEE, the level of sophistication is in general moderate, but there is greater variation than in Western Europe (a greater proportion of companies offering a low level or high level of sophistication). Also here, modern services are only offered on a limited scale. As in Western Europe, the level of sophistication in CEE is expected to increase. Some modern services will still not be offered on a wide scale.

In Ukraine, the sophistication of the offered services is at an average level, with a few exceptions, and fairly similar to CEE. In comparison to Western Europe, many activities have a low level of sophistication, although the number of 'services not offered' is higher in Western Europe than in Ukraine, possibly because the respondents' warehouses in Western Europe are less versatile than in Ukraine.

The level of sophistication is expected to change considerably over the next 10 years, in much the same way as in the CEE. The number of services not offered is expected to decrease to such an extent that, in 10 years time, fewer services will not be being offered in Ukraine than in Western Europe. This suggests that Ukrainian firms are eager to increase the range and level of sophistication of warehousing activities.

The sophistication of the services offered is viewed as a rather dynamic factor: in most cases, the respondents expect the level of sophistication to increase at least slightly. Moreover, this overall factor is a complex one since it reflects a considerable number of warehouse activities (in total 17 aspects were distinguished).

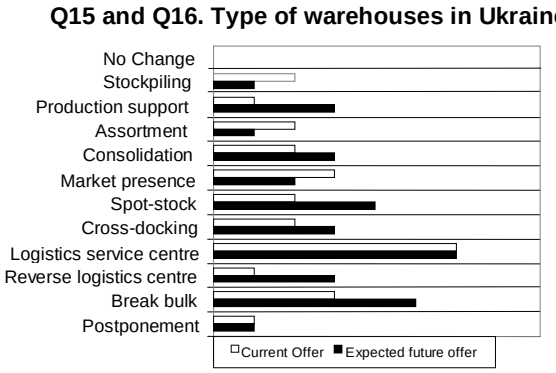
5.3 Site competence – warehouse types

When asked about the type of warehouses offered in Western Europe, consolidation, cross-docking and logistics service centres turned out to be the most common. In CEE, the most frequently offered were consolidation, cross docking, logistics service centres and break bulk warehouses.

The type of warehouse most commonly found in Ukraine was the logistics service centre (see Figure 4). All the respondents indicated that the number (although not all the types) of warehouses they expected to offer would increase in the future with logistic service centres, break bulk and spot-stock warehouses expected to become the most common.

Comparing Western Europe, CEE and Ukraine we can see similarities and differences in the types of warehouses offered. One similarity in all three geographic areas is the dominance of logistics service centres and, in Western Europe and CEE, of consolidation and cross-docking warehouses. One of the differences is that break bulk warehouses are more important in CEE, and increasingly in Ukraine, compared to Western Europe.

Figure 4 Types of warehouses currently offered and expected future offer in Ukraine



5.4 Threats and opportunities

When asked about the top three threats to the growth of 3PL services in Ukraine, the respondents indicated that the complex and 'old fashioned' regulations, norms and tax system constituted the biggest threat (see Figure 5). Economic and political instability and the lack of trust and awareness among Ukrainian firms and state institutions were the next most important threats.

Figure 5 Possible threats to 3PL growth in Ukraine

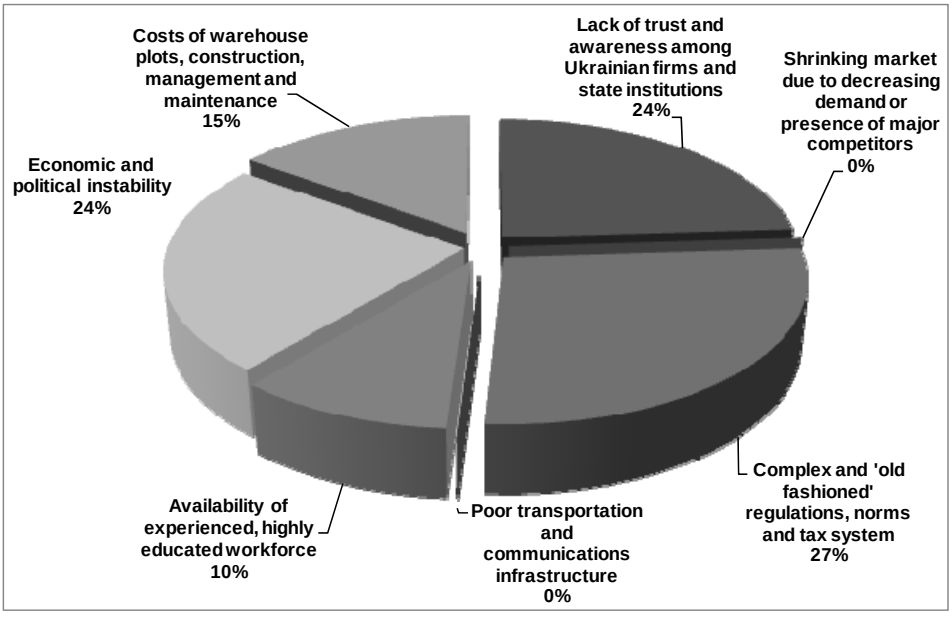
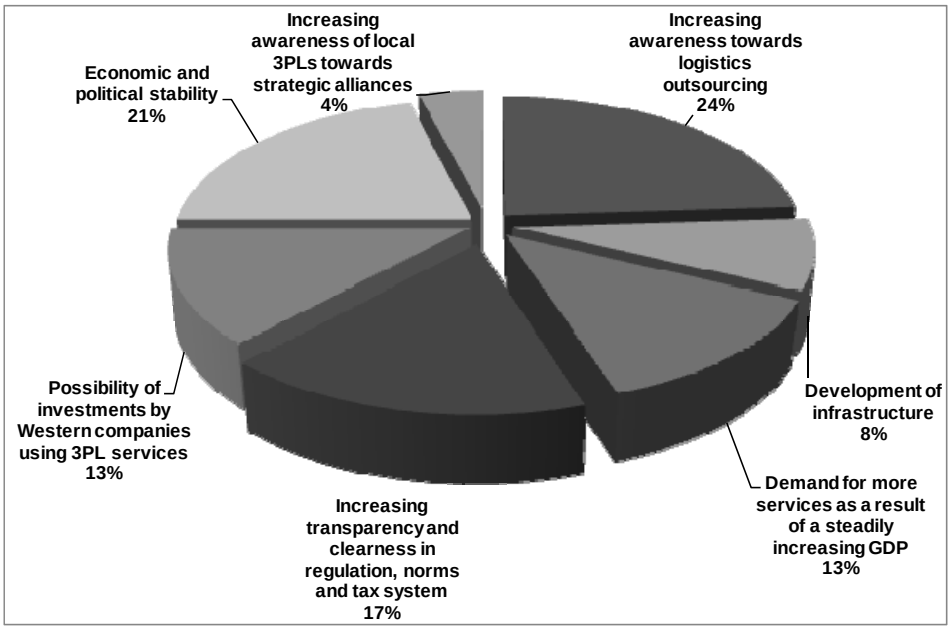


Figure 6 Possible opportunities for 3PL growth in Ukraine



The largest opportunity for growth in 3PL services in Ukraine is the increasing awareness of the benefits of logistics outsourcing (see Figure 6). Growing economic and political stability, and an increasing transparency and simplification of the regulations, norms and tax system form the next most important opportunities.

In the face of these threats and opportunities, it can be concluded that the respondents want to expand their operations in Ukraine by increasing the size and number of locations as well as by upgrading on-site competences by increasing the number and sophistication of services offered.

6 Discussion

6.1 Primary location drivers

According to the model, warehouses in their purest form are established either because there are low-cost input factors available or because of the proximity to the market. Labour costs are an important cost input factor, and labour costs in CEE are generally lower than in Western Europe. Eastern Europe countries outside the EU (like Ukraine) have even lower labour costs than CEE countries that are part of the EU, and this could make such countries attractive for specific warehousing activities.

However, as noted earlier, low labour costs often turn out to be a short term advantage (Graham and Sahling, 2004) and also do not necessarily lead to lower production costs because productivity may be correspondingly low (Toubal, 2004). As a consequence, relocating production to CEE countries does not necessarily take place because of this advantage; and this is supported by several studies (Pournarakis and Varsakelis, 2002; Konings, 2003; Narula, 2005). Rather, the emphasis is on available

labour skills due to the increasing sophistication of production techniques and new technologies (Pournarakis and Varsakelis, 2002), which are also seen in the warehouse activities of LSPs. This view seems to be supported by data collected from the 3PL providers active in Ukraine: in the future, both in CEE countries and in Ukraine, access to skills and know-how will become more important. The implication is that skilled labour needs to be available to ensure the desired activities can be carried out.

The data provided by 3PL providers show that market proximity is the primary reason why warehouses are established where they are throughout Europe. This does not come as a surprise as, in the past, many LSPs followed their clients (manufacturers) to new markets. Respondents expect that proximity to the market will remain the key driver in Western Europe, but that for CEE and Ukraine that access to skills and know-how will become more important. This can be explained by the anticipated increase in sophistication required for warehousing activities, leading to a need for a highly educated workforce.

6.2 Site competence

To work efficiently and effectively in meeting their designed role, the model suggests that due consideration should be given to the required site competences when establishing warehouses. Most warehouse activities throughout Europe and Ukraine already require an moderate to high level of sophistication, and the required levels are expected to increase in the future. The 3PL providers indicated that the need for technical expertise and/or advanced technology was the key implication in achieving site competence following an increase in sophistication (in line with the model). This need results from the increasing use of modern technologies in ever more logistics services, including specific machinery, specific materials and tailor-made software systems.

When the required level of sophistication is relatively high compared to the capabilities of a poorly qualified workforce (in terms of management and technological expertise), this could result in low efficiency. Therefore, the availability of skilled labour together with the quality of the transportation infrastructure and the reliability of the customs process are all important matters that should be considered when doing business in Eastern Europe. Generally, it will only be favourable to start warehouse activities in Eastern Europe when the process complexity is low and the labour quality adequate.

In Western Europe, once established close to a market, LSPs tend to extend their activities and their number of locations by drawing on the advantages of the already established warehouses including having a local presence and experience with, for example, customs regulations. The more developed 3PLs use skilled labour because of the growing awareness of the importance of having skilled employees and efficient supply chain management. In Western Europe, a highly educated workforce is, in general, more readily available than in CEE.

6.3 Emerging economy context

The threats to 3PL growth in Ukraine as mentioned by respondents (see Figure 5) are clearly linked to Razzaque's (1997) five composite variables. The most frequently mentioned variable concerns 'management system problems', including lack of trust (23%), and limited availability of highly-educated workforce (9%). Next are 'challenges

posed by the economic system' (old-fashioned regulations, 26%) and 'general problems' (economic and political instability, 23%). 'Infrastructure-related problems' (costs of plots and construction, 14%) are least mentioned, while no 'managerial problems' were mentioned (5% 'other', see Figure 5, remain unclassified).

Several of the opportunities and threats mentioned by respondents (see Figure 5 and Figure 6) are related to Ukraine being an emerging economy. Particular items are the 'complex and old-fashioned regulations' and the 'economic and political stability'. The finding that 'economic and political stability' are seen as both a threat and an opportunity indicates an ambiguity among respondents; this is probably related to the ongoing development of the macro-situation, that some view as positive (changing for the better) while others view them as negative (still underdeveloped). Looking at the number and frequency of the opportunities and threats mentioned by respondents, the overall picture shows a slightly positive balance.

7 Conclusions

The empirical findings support the model's emphasis on primary location drivers and site competence in determining a warehouse's strategic role and location. The developed model is particularly useful in supporting location decisions because it addresses the warehouse activities to be offered and the corresponding level of site competence required. For researchers, the implication is that more attention should be paid to the types of activities that an LSP is designed to offer. While Chen (2001) does involve human resources as one of his selection criteria, he does not explicitly relate this to the technical and/or management expertise required in supply chain management. The model and the empirical findings make clear that the available skills and know-how form a dominant location driver for warehouse types that require high site competence.

As indicated earlier (Section 2.3), the model can also be used to assist in the development of a warehouse. Over time, a warehouse's role will change, particularly in emerging economies. The findings underline Ukraine's status of an emerging economy, though it is in an early stage of emergence. By considering the primary location drivers and required site competences (including the set of warehouse activities and their sophistication) highlighted in the model, a change in warehouse role can be determined and planned explicitly. In such an application, the model constitutes a tool for the strategic development of a company's warehouses. In terms of site selection, the model as developed in this research suggests that it is important to consider the clients' current and future needs concerning warehouse roles and required level of sophistication when deciding on the longer term development of a potential warehouse site.

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Appendix

Table A1 List of companies approached

#	*Company*
1	ABX Logistics Ukraine
2	BDP Ukraine
3	EGL Ukraine
4	F Formula
5	FM Logistic
6	Formag Group
7	GeoDis Ukraine
8	Komora-S
9	Koninklijke Frans Maas Ukraine
10	Kuehne + Nagel Ukraine
11	Maersk Logistics Ukraine
12	OST-WEST Express
13	Panalpina World Transport LTD
14	Raben Ukraine Kiev Region
15	REP-Trans LLC
16	Revival Express
17	REWICO International Logistics
18	Schenker Ltd Ukraine
19	SKYNET Worldwide Express (EGL)

Table A1 List of companies approached (continued)

#	*Company*
20	TNT Logistics
21	Ukraine ICT Internationale Container Transport GmbH (Dachser)
22	Ukrainian Logistics Systems
23	Ukrainsky Vantazhny Kuriery
24	UPS Ukraine – Zat Delkar
25	Verhoeven/TV-Trans