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A VIRTUAL ORGANIZATION MODEL FOR INTERNATIONAL LCL TRANSPORTATION

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Abstract

The main purpose of this paper is to propose a virtual organization (VO) model that will serve for demand and supply match in less than a container load (LCL) transportation market. This VO will act as an e-4PL that coordinates 3PLs who offer LCL services on electronic platform and serve as an electronic marketplace where shippers of LCL cargo and suppliers of LCL services will meet. The model has been constructed through the examination of LCL transportation processes and through the analysis of global examples. The paper combines virtual organization literature with LCL transportation literature and provides a suggestion for the better utilization of the LCL transportation market. The proposed model provides an example for future initatives in the establishment of similar virtual organizations and serves as a solution to the cargo-container matching problem for practitoners in the LCL markets.

Key Words: *E-Logistics, Electronic Markets, Less Than a Container Load (LCL), Logistics, Transportation, Virtual Organizations.*

Uluslararası Parsiyel Konteyner Taşımacılığı İçin Bir Sanal Örgfüt Modeli

Özet

Bu makalenin amacı parsiyel konteyner taşımacılık pazarında arz ve talebin eşleşmesini sağlayacak bir sanal örgüt modelinin önerilmesidir. Bu sanal

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örgüt, parsiyel konteyner taşımacılığı hizmeti veren üçüncü taraf lojistik hizmet sağlayıcıları (3PL- Third Party Logistics Service Provider) elektronik bir platformda koordine edecek bir elektronik dördüncü taraf hizmet sağlayıcı (e-4PL – Fourth Party Logistics Service Provider) olarak faaliyette bulunacaktır. Bu elektronik platformda parsiyel konteyner yükleyicileri ile parsiyel konteyner taşımacılık hizmet sağlayıcıları buluşacaktır. Model önerisi, parsiyel konteyner taşımacılığı süreçleri ve küresel örneklerin incelenmesi yoluyla, geliştirilmiştir. Çalışma ayrıca sanal örgüt yazını ile parsiyel konteyner taşımacılığı yazınını birleştirmiş ve parsiyel konteyner taşımacılığı pazarının daha verimli şekilde yönetilmesine ilişkin çıkarımlarda bulunmuştur. Çalışmanın sonuçlarının, benzer sanal örgütlerin kurulması için gelecek girişimlere bir örnek teşkil etmesi ve bu örgütlerin yük-konteyner eşleşme sorununa bir çözüm getirmesi hedeflenmiştir.

Anahtar Kelimeler: *E-Lojistik, Elektronik Pazarlar, Lojistik, Parsiyel Konteyner Taşımacılığı, Sanal Örgütler, Ulaştırma.*

1. INTRODUCTION

The ultimate change that is going on every day throughout the modern life, forces organizations to evolve, adapt and find new ways in order to survive in the highly competitive business environment of the global marketplace. Megatrends like information and knowledge based products and services, the internet revolution, networking and interdependence and globalizations of markets and resources can be listed as the drivers towards increased virtualization. An alternative model to extend one's business beyond its natural boundaries is the virtual enterprise (VE) or VO (the terms VE and VO will be used interchangeably in this paper).

VOs are new types of organizational forms that are composed of geographically dispersed entities that collaborate through electronic mediums in order to initiate and facilitate temporal and flexible relationships for the achievement of mutual goals (DeSanctis and Monge, 1999). In the rapidly changing and highly competitive business environment of today, enterprises need to form alliances, create collaborations and combine resources in order to exploit market opportunities (Camarinha-Matos and Afsarmanesh, 2005). Different types of VOs are created and managed for this purpose. According to Larsen and McInerney's (2002) VO characteristics collection, these generally appear in the form of networks between independent enterprises that are located at different physical points. They contribute to the mutual purpose of the network by completing their partial tasks which generally are composed of single members' core-competencies. They are customer focused and respond to innovations in the market that create business potential. Finally the relationships between the network members have a temporal nature.

Network structure relationships are familiar concepts for supply chain management professionals where they integrate key business processes throughout the parties that take part in the production of goods and services from the raw materials stage until the finished products stage (Lambert et al., 1998). That's why the attention of supply chain literature regarding VOs and their utilization in supply chains keeps increasing (please check Gunasekaran and Ngai, 2004 for a detailed literature review). This is also related with the interorganizational nature of supply chains and the existence of major characteristics of VOs in today's global supply chains like geographical dispersion of independent enterprises, managing core-competencies and high reliance on technological developments.

However, despite having an international and interorganizational structure and being a part of global supply chains, maritime transportation literature has very few studies related with virtualization of organizations and its reflections in this industry. Among the limited literature, the impact of the development in electronic mediums on maritime business has been explored on the Greek shipping industry scale with "digital shipping" reference (Nikitakos and Lambrou, 2007). Another effort on the exploration of the interface between information and telecommunication technology (ICT) and maritime business has evaluated its support on dry bulk shipping contract management (Asbjornslett et al., 2012). VanBaalen et al (2008) focus on the ports' interorganizational structure and how they can collaborate with global supply chains through ICT and knowledge sharing.

Following the limited number of studies related with maritime transportation and VOs, this paper makes an attempt to fill this void by taking the container shipping industry as a showcase. Within the container shipping market, LCL transportation has been chosen as a setting for a VO creation. The VO's aim is to match LCL shippers with LCL service providers for achieving productivity in shipments and reducing transaction costs by the help of electronic means. Although auction or non-auction marketplaces are emergin in the world (vanHam and Kuipers, 2004), such a service is not available in Turkish shipping market. Therefore, this model also intends to provide an entrepreneurship suggestion for the practitioners in the field.

The paper is organized as follows. After the introduction in the first part, the second section explores the VO literature and defines different types of VOs together with their characteristics. The third section gives brief information about maritime transportation and LCL transportation. The fourth section summarizes the necessity of a VO in this sector. The alternative models are investigated and compared in Section 5 and the proposed model is explained in Section 6 together with its planned

functioning and process flow chart. The paper concludes with the advantages and possible limitations of the proposed model.

2. VIRTUAL ORGANIZATIONS

According to Whetten (1981), the interorganizational relations can be classified under four main levels. These are dyadic linkages, organization sets, actions sets and networks. The dyadic linkages are prevalent between two parties that aim to reach a common aim and they are generally the most basic form of interorganizational relations. Organization sets are the accumulation of the overall relations that a focal organization develops with the organizations that surrounds itself. The action sets are compositions of specific collaborative sets among organizations that come together for the achievement of certain purposes. Finally networks are a larger form of interorganizational relations that contain all the interactions between the dyads, organization sets or action sets. A network may appear in the form of a VO where multiple enterprises aim to combine their resources to achieve a larger scale of organizational goals (Ritter and Gemünden, 2003). The internet and related tools of e-commerce play an important role in enabling the development of a network perspective (Borders, et al., 2001; Santoro, et al., 2006). So taking a VO perspective to new networks being formed over World Wide Web (WWW) is essential in building the theoretical lense of such phenomenon.

Concepts and definitions related to the VE/VO paradigm are still evolving, and the terminology is not yet fixed. Nevertheless, exemplary practices of VEs can be discovered in different regions of the world, each functioning for different purposes and increasing in number every day. This situation justifies the need for the academic efforts in defining, classifying and investigating these new forms of organizations (Camarinha-Matos & Afsarmanesh, 2005). There isn't a consensus on the definition of a VO as the concept may appear in various versions and each version may carry different characteristics (Haas et al., 2007). However, the largely cited theory of VOs refers to three main parts which are listed as "virtually organized tasks", "metamanagement" and the combination of these two (Mowshowitz, 1994).

VOs are defined as a collection of geographically distributed, functionally and/or culturally diverse entities that are linked by electronic forms of communication and rely on lateral, dynamic relationships for coordination (DeSanctis and Monge, 1999: 693). According to Bultje and Van Wijk (1998), a VO is a network of geogprahically dispersed and legally independent organizations that collaborate in order to complete a part of a mission and their mutual effort results in the achieval of a common goal. The

market offerings of this network are innovative and customer focused where every member contributes with its own core-competencies (Bultje and Van Wijk, 1998). Kwon et al. (2003) takes a different perspective to VOs and states that a "pure" VO is an entity that does not own the traditional factor of productionA different point of view states that the "pure" VO is a new type of organization which does not own the traditional factors of production (Kwon et al, 2003). Majority of the VOs have only "offices or warehouses" on cyber space and what they produce is real time information through the help of software and supporting programs. Naturally the traditional factors of production are not utilized in this production process but one can say that these organizations are integrators of factors of production that are supplied or demanded by geographically dispersed and independent enterprises prevalent in the network.

If this integrating function of VOs is taken into consideration then one of the major prerequisites of integration depends on knowledge sharing. Pamkowska (2008) emphasizes not only knowledge sharing but in general resource sharing for achieving common goals through knowledge-based cooperation as important characteristics of VOs. Likewise Pamkowska (2008), National Science Foundation (NSF) as well mentions cyber infrastructure or internet as the common medium for resource sharing (NSF, 2010). In addition to the reliance on cyberspace, Barnatt (1995) underlines the development patterns of VOs dependent on computing and communication technologies and interorganizational nature. Travica (1997) contributes to the above listed characteristics of a VO by mentioning that a VO is a distinct organizational entity and is not a property of any of the organizations that are collaborating through it.

The common notion of all these definitions is that the members of a virtual organization are either geographically or legally separated. They form a network via the use of electronic devices, mainly the internet, to achieve a mutual goal or to adapt environmental changes quickly. These virtual networks and virtual organizations have taken their places in many different parts of people's and institutions' lives. The extent to which they are being used differs depending on their goals and the degree of acceptance by the users. As they take their power from information technology (IT), IT may complete tasks which used to be performed by human power in some cases or it may only support the human action (Sotto, 1997).

Mazzeschi (2001), has classified the VOs into four main groups:

Internal Virtual Organization: In such a VO, different business functions or groups of employees work as a VO within an organization's legal boundaries. However, they need to work in a flexible manner because they are physically located at different points.

Stable Virtual Organization: Such VOs work in the form of outsourcing. A focal company develops the VO by outsourcing certain functions to different entities that are specialized in performing them.

Dynamic Virtual Organization: This type of VOs appears as a response to a new market or business opportunity (also emphasized by Afsarmanesh et al., 2009). They generally have a large scale and a temporary nature. The members may change or the VO may completely be called off.

Web-company: This version of a VO is also called the "agile organization" and requires the use of internet in temporary collaboration of different organizations. Knowledge management and knowledge sharing are essential in the achievement of common goals and production of market offerings.

According to Mowshowitz (1994) virtually organized tasks allocate the concrete satisfiers to the abstract requirements of a certain task that is aimed to be accomplished in an organization. The metamanagement part manages the selection, allocation and optimization processes for achieving the goals of virtually organized tasks. The combination of these two, creates the virtual organizations that have a very unique contribution to organization theory; i.e. ability to switch (Mowshowitz, 1997). By switching it is meant that the concrete satisfiers for abstract requirements may be allocated iteratively in order to find the best matching alternatives with the help of virtual organizations.

Similarly, Pihkala et al. (1999) emphasize the existence of loose ties between the members of the network, the temporary relationships and the complexity of the network system as indicatory characteristics of VOs. So through "switching (Mowzhowitz, 1997)" the members within the network of a VO may continuously change and the network system is a flexible, agile and adaptible one especially for small scale companies (Strader et al., 1998). Small-sized enterprises utilize especially electronic business tool in order to achieve economies of scale by the help of collaborative VOs (Ritter and Gemünden, 2003).

With the existence of electronic business tools, VOs are also examined by electronic commerce literature. However, as Camarinho-Matos and Afsarmanesh (2005) have differentiated, e-Commerce practices are mainly related with business-to-consumer activities where the aim is to realize simple buying/selling transactions. However, the existence of a VO requires collaboration between enterprises so it works on the industrial market level and requires a common goal that is achieved by collaborative action.

When the current literature on VOs is explored, different studies can be detected which are focusing on different dimensions of these entities.

Networking capabilities of Small and Medium Sized Enterprises (SMEs) and their participation in VOs (Pihkala et al., 1999), intelligent management systems required in VOs (Xu et al., 2002), information infrastructure required to manage VOs and their life cycle (Strader et al., 1998), VO for supply chain integration (Wang and Chan, 2009), responsiveness (Gunasekaran et al., 2008) and collaboration (Manthou et al., 2004), managing conflict of interest in VOs (Arenas et al., 2008), agent-based VO designs (Norman et al., 2004; Ghenniwa et al., 2005; Markus et al., 2010), risk mitigation in VOs (Grabowski and Roberts, 2006) and trust building in VOs (Kasper-Fuehrera and Ashkanasy, 2001) are among the contribution to the related literature from different perspectives.

Jacobsen (2004), has stated that the contributions of many authors to the VO literature focus on either the structural perspective or the process perspective. While the former investigates the building blocks of the VO, the latter mainly focuses on behavior and operation. The main aim of this paper is to propose a VO model for Mazzeschi's (2001) fourth type of VO, web company that will serve for demand and supply match in LCL transportation market. This VO will act as an e-4PL that coordinates 3PLs who offer LCL services on electronic platform and serve as an electronic marketplace where shippers of LCL cargo and suppliers of LCL services will meet. By achieving this aim, the proposed VO will serve as a solution to cargo matching problem in LCL market and will act as an accelerator for LCL capacity fulfillment.

To the best of our knowledge, such a VO does not exist and does not function for the moment at the Turkish market. The only Together with this electronic marketplace where shippers will easily find space to load their part loads and service providers will easily find cargo to fulfill their containers; the service for small sized but frequently ordered shipments is supposed to improve. This will result in more flexible supply chains, will contribute to the reduction of time required to produce the LCL transportation service and will enable the just-in-time delivery of this service.

3. MARITIME TRANSPORTATION AND LCL

The goods and services are rarely produced and consumed at the same geographical point. Transportation is the flow of goods and services from one point to another during their rotation towards the final consumer within the supply chain (Chopra & Meindl, 2004). Maritime transportation is one of the most commonly used modes of transportation. Because commercial maritime transportation generally carries goods between

countries and continents, it is seen as an international transportation activity. This international character is being supported by the internationally dispersed network of vessel operations, vessel agencies, ship owners, representatives of the same maritime transportation company (Kristiansen, 2005).

Maritime transportation is being preferred for its high cargo volume capacity that utilizes economies of scale and provides a lower cost transportation alternative to customers. However, due to its nature it is not able to provide direct consignor to consignee connectivity. Also it is a slower mode of transportation when compared to air or land transportation due to the structure of the rotation and operation times at ports of loading, transshipment or discharge (Mangan et al., 2008).

It has a major part in the nations' transportation economies. Table 1 shows the annual foreign trade volumes of Turkey in terms of US dollars from 2005 to 2010 and the distribution of foreign trade over transportation modes. When the total foreign trade figures are checked, the negative effects of global economic crisis can easily be seen especially on 2009 performance. The increasing trend till 2009 has been suspended and seems to recover in a long period of time. However, the percentage share of sea transportation seems to be stable and covers more than half of the total in and out movement even if the total foreign trade performance is volatile. This shows the importance of maritime transportation in Turkey.

Table 1. Foreign Trade by Mode of Transport (000 US Dollars)

Year	*Total*	*Sea*	*Rail*	*Road*	*Air*	*Others*	*% of Sea*
2010[1]	138 145 785	79 870 319	1 637 905	40 468 522	11 143 574	5 025 466	0,58
2009	243 054 437	130 315 594	2 630 396	75 907 449	21 326 688	12 874 310	0,54
2008	333 990 770	190 691 605	3 833 971	92 198 602	27 333 724	19 932 868	0,57
2007	277 334 464	153 025 595	3 623 067	83 126 263	23 932 461	13 627 077	0,55
2006	225 110 850	124 066 678	3 107 865	67 853 942	18 574 108	11 508 256	0,55
2005	190 250 559	102 167 289	2 573 457	60 271 018	17 050 735	8 188 060	0,54

Source: TUIK, www.tuik.gov.tr, 2010

There are several important subheadings regarding maritime transportation.

[1] The figures show the foreign trade volume till the end of June 2010.

3.1. Parties Involved in Maritime Transportation

There are many different parties that are involved in maritime transportation. These vary from ship brokers to ship supply companies; from class institutions to International Maritime Organization (IMO) and from surveyors to insurance companies. The logistics service providers are the agents that act as an intermediary in maritime transportation sector and these are classified to four different parties as per below:

First Party: The shipper, producer, retailer or the sender

Second Party: The consignee, receiver, direct customer of the first party

Third Party: Logistics service providers, freight forwarders, non vessel operating common carriers (NVOCCs), warehouse agents, carriers

Fourth Party: The party that coordinates and controls the overall logistics activities of a specific company or supply chain, the party that coordinates 3PLs in order to achieve logistical targets of its customer(s).

Freight forwarders (FF) are defined by Lambert et al. (1998) as companies that serve both to shippers and carriers by organizing and coordinating the transportation of goods. Besides transportation services they can also offer warehousing, insurance, fumigation, lashing and other related operations.

Third party logistics (3PL) service providers are the intermediaries that the companies outsource their Logistics activities which have been executed in-house before (Larsen, 2000). According to Lieb et al. (1993) *third-party logistics involves the use of external companies to perform logistics functions that have traditionally been performed within an organization. The functions performed by the third party can encompass the entire logistics process or selected activities within that process.*

While outsourcing these functions were only to reduce costs and save capital for other investments, today using 3PLs have several other reasons like increasing market coverage, improving the level of service or increasing flexibility towards the changing requirements of customers (Larsen, 2000).

NVOCCs are a different classification of ocean carriers by Federal Maritime Commission (FMC) of the USA. According to FMC an Ocean Transportation Intermediary is either an ocean freight forwarder or a non-vessel operating common carrier (NVOCC). An ocean freight forwarder is an individual or company in the United States that dispatches shipments from the United States via common carriers and books or otherwise arranges space for those shipments on behalf of shippers. Ocean freight forwarders also prepare and process the documentation and perform related activities

pertaining to those shipments. An NVOCC is a common carrier that holds itself out to the public to provide ocean transportation, issues its own house bills of lading or equivalent document, but does not operate the vessels by which ocean transportation is provided, and is a shipper in relation to the involved ocean common carrier (FMC, 2010).

FFs are represented by International Federation of Freight Forwarders Associations (FIATA) on international platform. The FFs that are licensed by FIATA in Turkey are allowed to issue their own bills of lading.

According to Chu et al. (2004) fourth party logistics (4PL) service provider is *an integrator of services provided by 2PL and 3PLs, achieving a "1-point" contact for the 1PL manufacturer*. A 4PL service provider makes sure that end to end service is secured within a supply chain. Bade & Mueller defines 4PL as *a supply chain integrator that assembles and manages the resources, capabilities and technology of its own organization with those of complementary service providers to deliver a comprehensive supply chain solution* (Bade & Mueller, 1999).

3.2. Containerization

Containerization is one of the milestones of maritime transportation, especially in terms of international trade. The vulnerable nature of goods being carried between continents during long transit times have suffered a lot from the unexpected weather conditions, accidents and several handling damages during their journey. Containers, which are standard carriage units made up of steel and wood, could not eliminate the damages caused by these factors totally but they made serious positive effect on the maritime transportation quality of goods (Lambert et al., 1998). The first container that has been transported was loaded from New York port to Houston port in 1956. It is accepted as one of the initiators of globalization and changed world trade strategically (Levinson, 2006).

Less Than a Container Load (LCL) transportation is a type of containerized maritime transportation. The logic behind LCL shipments is the same logic behind consolidation services. Consolidation means gathering of cargo belonging to different shippers and uniting them in a carriage unit in order to carry to their common final destination.

According to Ford's (2006) example that he proposes in his dissertation, a shipper has two alternatives for consolidation:

1 - To wait for the partial goods that he/she produces to accumulate in order to stuff one full carriage unit and load them.

2 - To combine his/her cargo with other cargoes at an optimum point of consolidation in order to combine them to fulfill one carriage unit.

The important point about the first consolidation option is to keep the waiting time just as long as the consignee wants to bear the cost of waiting. The important point about the second consolidation option is to find a consolidated carriage unit that will depart at the time that the shipper wants to load his/her cargo. The model proposed in this paper, provides an accelerator for this second consolidation option on the electronic marketplace.

3.3. LCL Transportation

When a shipper does not have enough finished goods at hand in order to fulfill one container; he/she sends an LCL freight inquiry to his/her freight forwarder (FF) who already gives LCL services or sends the inquiry to his/her FF who does not have an LCL service and this FF starts a market rate research in order to find a low cost competitor for a co-load. Co-loading is the term for a FF to assign his/her customer's cargo to another FF because the assigning party is not able to provide some of the services.

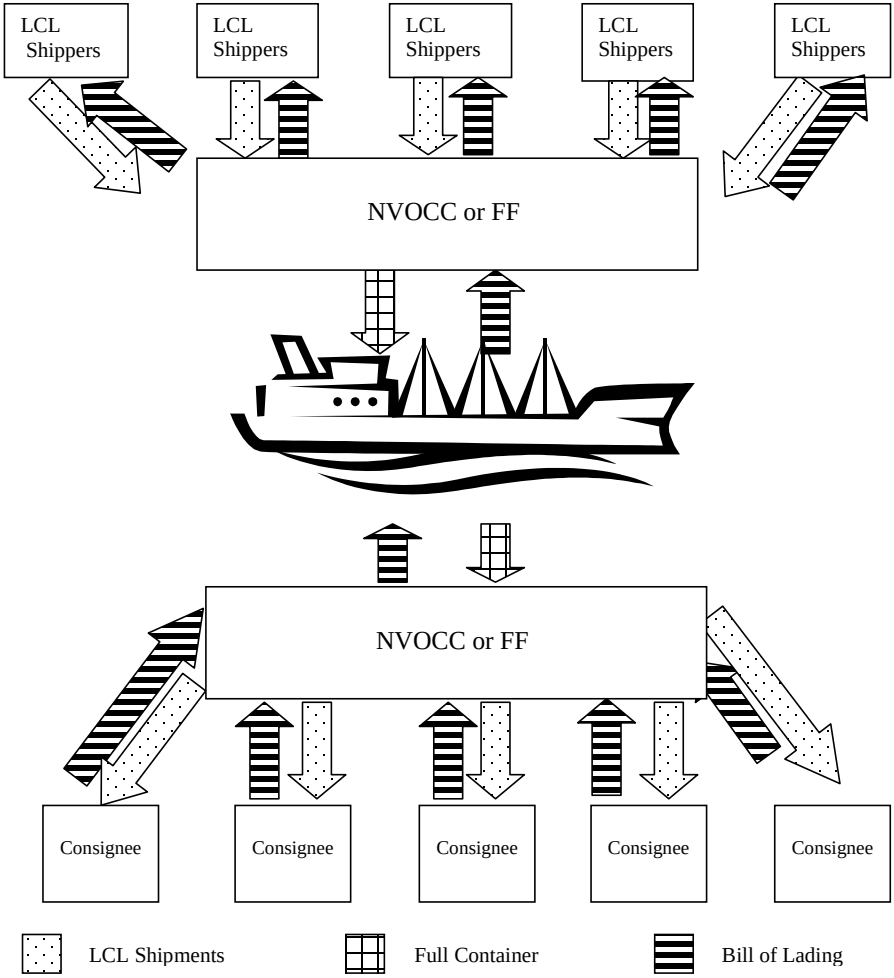
The advantage of using LCL services is to pay the freight exactly for the space that is covered by the cargo itself. All of the LCL shippers are charged according to their cargoes volume/weight ratios (Whichever is bigger is taken into consideration while being priced). Below is an example of an LCL shipping instruction of a FF. The container is going from Izmir port to Antwerp port. The average market rate for 1x20' box from Izmir to Antwerp is Euro 300 + local charges. The FF advises that they are charging for Euro 20-25 per chargeable weight/volume for this trade and they generally stuff around 20 tons/20 cubic meters in 1x20' box. So adding the freight rates and the local expenses of five or six shippers in one container sums up to Euro 500. This clearly proves the profitability of LCL shipments.

1* SHIPPER DECLAR. NO :	2 PALLETS	PUMP HOUSING	1.215.00.-KG
2* SHIPPER. DECLAR. NO :	1 CASE	TRAVERTINE MARBLE	880.00.-KG
3* SHIPPER DECLAR. NO :	4 PALLETS	BUTTERFLY VALVE	3.005.00.-KG
4* SHIPPER DECLAR. NO :	5 PALLETS	LEAF SPRINGS	4.339.00.-KG
5* SHIPPER DECLAR. NO :	1 PALLET	CERAMIC	450.00.-KG
TOTAL :13 PCS // 9.889.00.-KG			

Source: The LCL shipment instruction is provided by a freight forwarder located in Izmir.

Figure 1.
LCL Shipment Instruction

The FF/NVOCC who gives the LCL service, receives the partial loads at the port area or a warehouse at a pre-determined stuffing date, consolidates and loads them into the container. After the vessel leaves the port, the FF takes the Master Bill of Lading (B/L) from the vessel agency. Later, the FF prints the House B/Ls for the shippers who have cargoes in the LCL container and sends these in receipt of the freight payments of the shippers. The shippers endorse these House B/Ls and sends these to their consignees. The FF endorses the Master B/L and sends it to his/her corresponding agency at the port of destination. The corresponding agency, takes the delivery of the full container when the vessel arrives and hands the Master B/L to the vessel agency at the port of destination. Then he/she deconsolidates the full container either at the port or at a warehouse and delivers the separate goods to different consignees in receipt of the House B/Ls. Figure 2, shows this process briefly.



Source: Adapted from Estis, T.B. (1988). NVOCCs: A Low-Cost Alternative for LCL Shippers. *Traffic Management*, 27(6): 87 in Lambert et al. (1998)

Figure 2.
The Process of LCL Shipments

4. THE CURRENT SITUATION

The main problem of LCL shipments is the difficulty of matching supply with demand. The agents such as FFs, 3PLs, 4PLs or Non Vessel Operating Common Carriers (NVOCCs) act as market makers providing market search, price discovery and market clearance services. On the demand side they serve shippers with pricing, pick up / delivery, invoicing, insurance and documentation services. On the supply side they provide consolidated shipments and discovery of available LCL cargo capacity to carriers (Nault & Dexter, 2006). However the supply hardly ever completely matches with the demand when the real market situation is checked.

Either the container stays under capacity due to last minute order cancellations and the FF does not want to ship it that way because it is not profitable; or the FF has to ship the container and lose money because there is important and urgent cargo in the LCL and that customer can not be turned down. At the first case, the other shippers have to wait till the next vessel for the container to be fulfilled so their shipments are delayed. At the second case the FF is losing money against his/her services in order not to lose the important customer. Also sometimes when an LCL container is already full and ready to be loaded, there is an additional shipment demand which is not enough to fill up a new container but is not able to fit in the available LCL. This cargo has to wait till the next vessel too unless the shipper finds an alternative LCL service supplier FF with free space for the relevant dates.

Another initiator for the proposal of this VO model is the changing structure of global supply chains and international trade**.** According to data from International Transport Forum, in 2009, world GDP fell by 2.3%. In the European Union GDP fell by 4.2%, while in the United States and Russia GDP dropped 2.4% and 7.9% respectively. A specific feature of the crisis was the globally synchronized trade collapse, with world trade volumes dropping 12%. The global economic crisis and the collapse of world trade in 2009 had a major impact on the transport sector. World container traffic (TEUs) fell by 26% (ITF, n.d.). Being in the middle of Asia and Europe and on the cross roads of old and new trade paths, Turkey is highly effected from this change for sure. When the foreign trade figures in Table 1 are checked, it is seen that the foreign trade in terms of 000 US dollars have diminished by 27% from 2008 to 2009. This contraction in demand caused a serious decrease in the overall container transportation. According to under secretariat of Maritime Affairs, the overall container handling in Turkish ports has diminished by 15.2 % in 2009 in terms of TEUs (Chamber of Shipping, 2010).

The global economic crisis and diminishing demand generated the necessity for lower volume shipments. The buyers stopped buying in big lots; they hesitated to keep high levels of inventory so they started to decrease their ordering quantities. This had a major effect on global supply chains. Traditional supply chains were serial systems where the inputs like raw materials enter from front end and they are transformed to outputs like finished goods at the other end (Wang & Chan, 2009). However they changed together with the introduction of globalization, with the developments in information technology and with the effect of customized customer demands they had to change into flexible, highly responsive, geographically dispersed but highly coordinated networks (Gunasekaran et al. 2008; Van der Vlist et al. 1997). The responsiveness and flexibility requires the ability of supply chains to adapt new business opportunities or environmental changes easily and is perceived as one of the main contributions that VOs provide to organizational activity (Buhalis, 1998). The quite effective change in the economic environment of these global supply chains in 2009, forced the suppliers to leave their old habits of shipping large volumes and to investigate the alternatives to ship in small lots and keep the trade wheel turning. Agile supply chains that aim to bring their products into the markets faster than competitors and at a lower cost have to use all alternative ways to transport. Also, in an effort to achieve flexible and responsive supply chains, many companies have decentralized their value-adding activities by outsourcing and developing VOs (Gunasekaran & Ngai, 2004).

5. THE ALTERNATIVE MODELS

In 2006 Nault and Dexter have developed a model for agent intermediated electronic markets (EM) and they implemented their model in LCL transportation market. The result of their study showed that the EM increased agent participation and investment so the overall demand and supply increases in such a market. In 2007 Chow et al. have developed a Strategic Knowledge Based System (SKBS) for Consolidated Freight Services (CFS) in Hong Kong. Taking Hong Kong's part load potential as basis, they established an online system supported with tailored software for the collaborative logistics network. They tried the system on the LCL shipments of a freight forwarder and the results proved that the system provides increased resource utilization and higher customer retention.

The model in this study is a VO example for Turkish LCL markets. This model is not a system for a single company or the network of a single supply chain. It is an electronic marketplace where buyers and sellers will meet and perform transactions. While building up the model, the studies of

Nault & Dexter (2006) and Chow et al. (2007) were taken into consideration. Also the international and domestic examples of e-logistics websites were analyzed. The structure of the model is developed by benchmarking these worldwide examples.

The websites that have been analyzed for the study are listed as per below (Chow et al., 2007; Sarkis et al. 2004: 307):

- www.freightquote.com
- www.gocargo.com
- www.transplace.com
- www.getloaded.com
- www.elogex.com/index.php
- www.gtnexus.com/network/overview.php

In Turkey, we have reached four websites that aim to serve transportation market. These are:

- www.navluniste.com
- www.nakliyeborsasi.com
- www.lojismatik.com.tr.

The benchmark regarding these websites is summarized in Table 2. There are mainly four groups: (1) Freight inquiry systems (2) Commercial systems (3) Systems serving only for land freight (4) Integrated SCM and e-logistics solution providers. The model proposed in this paper is an internet based EM that aims to serve as a marketplace where LCL shippers and carriers will meet and find cargo or container space according to their needs. As summarized below, Freightquote is a website that provides freight rates for all modes of transportation including LCL and has one website for the USA and one for EU. They also organize the shipments on behalf of shippers but they have online sales representatives that serve to customers so this site works like a semi-electronic freight forwarder.

Table 2. Benchmark of Similar VOs

	Scope	Target Market	System	Comparison
Freightquote	Freight inquiry and shipment organization for all types of transportation	All shippers, carriers and intermediaries	Starts electronically, continues with a real sales representative	This model includes LCL in it but is not totally internet based
Gocargo	Commercial website that lists the required type of transportation companies	All shippers, carriers and intermediaries	Commercial listing of related search	Listing for providers function resembles
Transplace	Supplies specially tailored information systems, serves integrated 3PL solutions	Shippers and supply chains that aim to outsource logistics activities	Logistics Information Systems (LIS) based	The model will support these SCM solutions with the ability of frequent, small sized orders
Getloaded	EM for landfreight shippers and carriers	Landfreight shippers and carriers	Internet based	The landfreight version of the model
Elogex[2]	Supplies integrated supply chain solutions from inventory management to logistics planning	Shippers and supply chains that aim to outsource logistics activities	LIS based	The model will support these SCM solutions with the ability of frequent, small sized orders
GTNexus	Develops collaborative logistics networks on internet for global logistics solutions.	Shippers and supply chains that aim to outsource logistics activities	LIS and Internet based	The model will support these SCM solutions with the ability of frequent, small sized orders
Navluniste[3]	Provides quotes for freight inquiries	All shippers and intermediaries	Internet based	Freight inquiry part is similar
Nakliyeborsasi	EM for landfreight shippers and carriers	Landfreight shippers and carriers	Internet based	The landfreight version of the model
Lojismatik	E-logistics website mainly for landfreight and household goods transportation	Landfreight and household goods carriers and shippers	Internet based	The aim is common, but this model currently works only for landfreight

Source: Altuntas (2010)

[2] The name has been changed to onenetwork.com and the web page is automatically directed.

[3] The Turkish examples which were active during the time that the paper was first written, have either been sold to other parties or are being renewed at the time of the publication of this paper. New initiatives are in place though, like ETA (etasimacilik.com).

Gocargo serves like a Google for the transportation sector and list the names and contact details of related searches on their website.

Transplace, Elogex and GTNexus are integrated solutions that use Logistics Information Systems (LIS) together with internet and develop supply chain management (SCM) systems tailored for their customers. The customers may be single companies or a total supply chain. This model will support the information system of such integrated logistics systems by giving chance to Turkish members of global supply chains to ship their partial loads efficiently without losing time.

Getloaded and Nakliyeborsasi are similar examples of the model proposed in this paper but they target the land freight market. They aim to meet the shippers and carriers of road transport on electronic marketplace in order to utilize the empty space on trucks with cargo waiting for an empty space.

Navluniste is a freight inquiry tool that aims to provide fast and effective information about the freight market rates to the users and by doing so helping them save time during their market research.

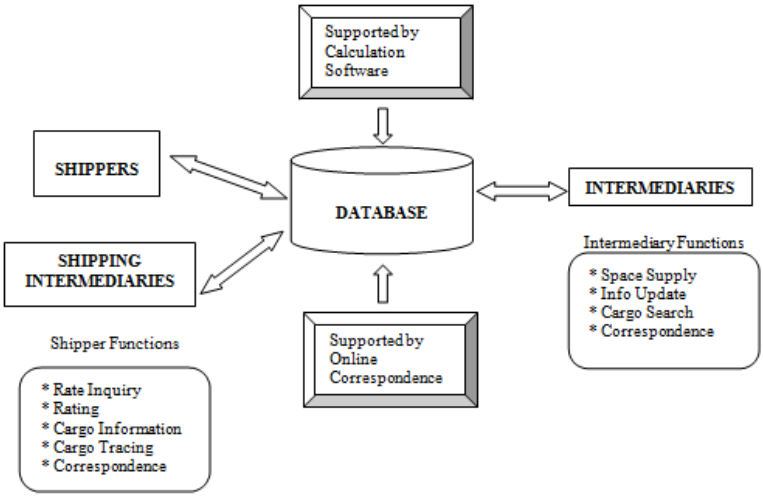
Lojismatik is a new initiative that aims to provide all transportation services electronically in the future for shippers. For the moment they are mainly serving to road transport sector.

When all these models are analyzed, it is seen that the VOs serving to the foreign logistics or transportation market have proved to be effective and are being used by many customers. However, Turkish VOs in this area have not been adopted by shippers or intermediaries thoroughly yet. The advantages of internet and web based systems are not being utilized by the parties that are involved in such a dynamic and multi layered sector. So the model aims to fill this empty space in the sector.

6. THE PROPOSED MODEL

VO Model - Electronic Market for International LCL Transportation (VIRTUA-L-CL)

The VIRTUA-L-CL model is shown on Figure 3. The database in the middle contains the supply information regarding the LCL market of the related dates. The database is used by the shipper members and the intermediary members for the actualization of different functions. It also has two different supporting functions in order to keep the system flowing smoothly. The model is designed in order to simplify the daily procedures of a standard LCL shipment.



Source: Altuntas (2010)

Figure 3.
Proposed Model for VIRTUA-L-CL

6.1. Shippers

There are two different types of shippers that search for free container space for LCL shipments. These are real shippers i.e. exporters or producers and co-loaders. Co-loading is the act of combining an intermediary's LCL cargo with another intermediary. This is because the intermediary who has the part load does not provide an LCL service, so he/she has to assign this cargo to another intermediary who gives this service. (From now on the term shipper will symbolize both the real shippers and co-loaders).

The shippers will obtain membership to the system through an initial entrance fee plus monthly membership renewal fees. They can be located either in Turkey or may be located in other countries but are in trade transactions with Turkish companies.

The system will have a different entrance screen for the shippers and after they log-in with the user names and passwords they will keep seeing the shipper screens till the end of their transactions.

Shippers have five main functions according to the model. Rate inquiry is their basic aim in the system. This function is closely related with the function of cargo information research. Shippers will try to find the best fitting space for their cargo, on the date that they are ready to ship and at the freight rate that they are willing to pay. The model's database will provide them the options within these criteria. The pricing and shipment organization

will be done according to the cargo information that the shippers provide so the shippers will be fully responsible from the data they insert into the system.

Rating function is very important for both the shippers and the intermediaries. The intermediaries will be listed depending on their performance grading results after a search is executed by a shipper. This will support the reliability of the information that is given by the system because this function will encourage the intermediaries to update the cargo, vessel or documentary information periodically in order to climb upper stairs on the service providers list.

Rating module is under the responsibility of the shippers but they may have the tendency to skip this step to reach the search results quickly. In order to avoid this, the rating module will be compulsory to fill out before being able to make any search in the system. Once a shipper makes an intermediary search and uses the services of an intermediary, the system will ask him/her about his/her grading regarding: (a) Right information, (b) On-time information, (c) Tracing quality, (d) Updating performance, (e) Documentary performance, (f) Freight levels. The intermediaries will be listed according to their overall performance among these criteria.

Cargo tracing is another function of the shippers. They will use their booking numbers for tracing that are given by the system once they confirm a cargo reservation and this booking number will act as an id number for that specific shipment. Shippers will be able to learn where their cargo is at a specific time, the updated transit time left till the port of destination and cargo delivery via the system.

6.2. Intermediaries

Intermediaries symbolize all the 3PLs, 4PLs, FFs and shipping agencies who would like to offer LCL services via this system to the demand side of the market. These intermediaries may be the branches of global 3PL or 4PL companies that are located in Turkey, or they can be the single enterprises that act within global freight forwarding network organizations like IFLN-International Freight and Logistics Network and WCA-World Cargo Alliance.

Intermediaries' basic function is to supply the needed space and organizational ability in order to realize part-load shipments. They search for the cargo that is looking for free container space in the market that they serve.

Within this system, they have to act quickly in order to publish the most up to date information. They have to update the system continuously to

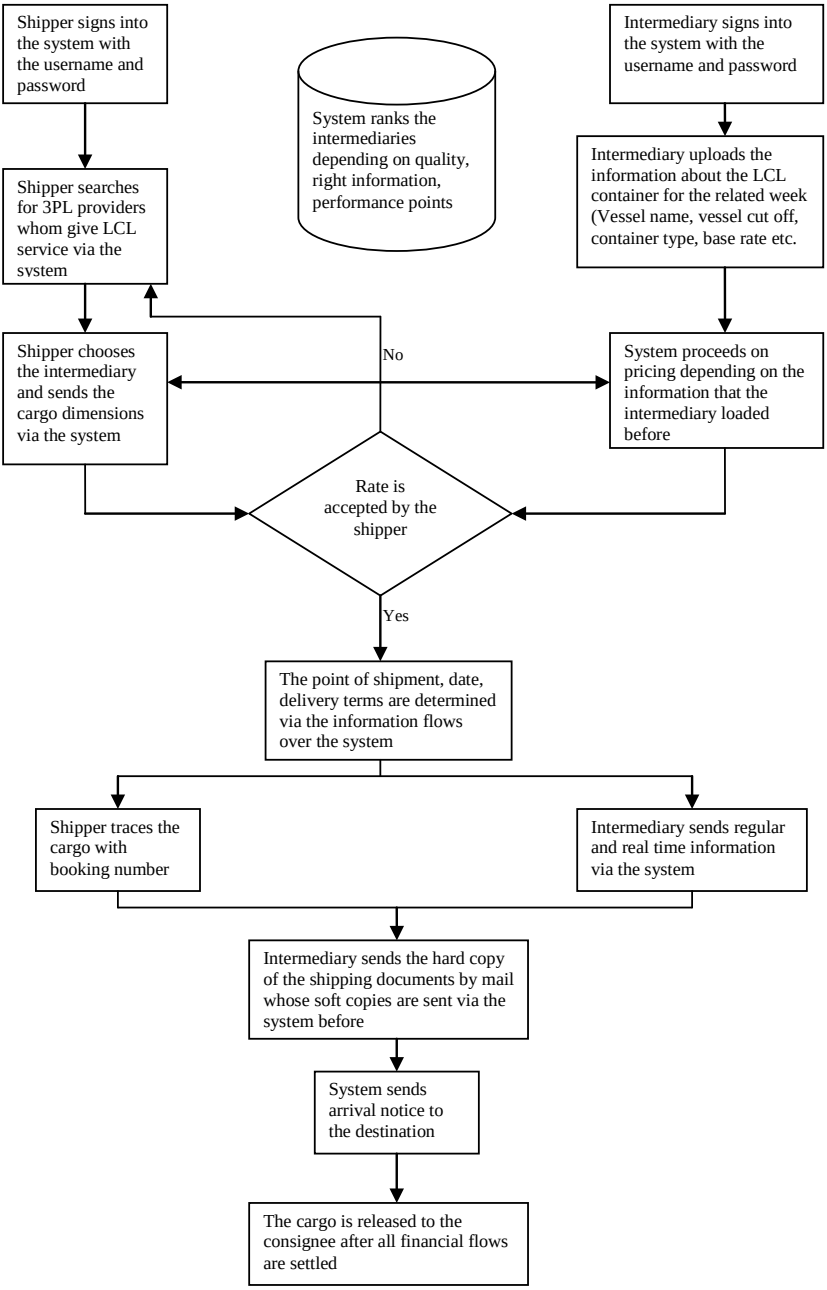
secure that correct information regarding the container's journey is received by the shippers who are tracing the situation of their cargo. This updating function is very important because their performance will be evaluated according to this function by the shippers.

6.3. Supporting Functions

Calculation software is needed in order to calculate the chargeable weight of the part-loads. Chargeable weight is the weight or volume of the partial cargo that will be multiplied with the unit freight rate of the service provider. It changes according to the weight and the dimensions of the cargo. The calculation software will then find the unit price of the related intermediary for the specific service from the database and calculate a total rate of the shipment whose details are inserted into the system by the shipper.

Correspondence is necessary in order to send shipment instructions to the intermediaries, to organize the loading process, to organize precarriage if there is any and to perform other inquiries regarding the shipment. In order to build up this link, a quick messaging module and an e-mailing module is inserted into the model as a supporting function.

The flow chart of these functions is summarized on Figure 4. The VIRTUA-L-CL has eight different levels. The first level is where the users log into the system. There are two different types of users which are shippers and intermediaries so there are two different types of user screens. The second level is the search level for the shipper and service information insertion or update level for the intermediary.



Source: Altuntas (2010)

Figure 4.
Flow Chart of VIRTUA-L-CL

At the third level the cargo details are sent to the intermediary through the system. The cargo pricing is also realized at this step according to the previously inserted data by the intermediary. At the fourth level, the shipper and the intermediary share the shipment details via the system. After the shipment is done, the shipper is able to trace his/her cargo online through the system. The intermediary is responsible from updating the system with the latest data in order to serve real time information at this fifth level. Sixth, seventh and eighth levels are necessary for the exchange of the required documents and information related to the completion of a shipment. The flow is finalized with the information flow between the shipper, intermediary and the consignee or the consigning agent.

The model inputs will be analyzed from two different entrance points. The first one is the shipper booking details. The second one is the free container space information that the intermediaries supply to the system. The model is web based and has an infrastructure that secures access from all points that have internet.

The presented model of a VO in this paper can be classified into "Exchange Catalogue" type of EM collaboration according to the study of Wang and Archer (2007). According to their study, Exchange Catalogue type of electronic collaboration between separate organizations on virtual interface is the one where EM does not take the ownership of the products or services. Instead it only coordinates the buying and selling activities.

7. CONCLUSION

In today's global marketplace, the purchasing and selling activities do not work upon the concept of dyads – relationships between one buyer and one seller – anymore. Today business goes on through electronic commerce activities which are a technology not of dyads but of networks. The person to person interface of the classical marketplace is replaced by the virtual interface that is accessible from all parts of the world at all times (Borders et al. 2001). These networks of organizations located on a virtual interface, benefit from the advantages of mass marketing at low cost. The customer side of these virtual networks benefit from the advantages of lower prices due to increased competition and increased ability to reach a larger supplier database.

According to Ghenniwa et al. (2005), eMarketplaces enable one-stop shopping for products by consumers, who depend on a variety of other products and services that can spread across several marketplaces. Likewise, suppliers can reach, discover, and develop new customers across various eMarketplaces quickly with low cost. In general, eMarketplaces offer

businesses the chance to develop and enhance their most important relationships—those with customers and suppliers. The aim of this paper is to provide such an eMarketplace in the form of an independent VO, that enables freight searching and cargo matching for LCL shippers and service providers. As such an organization is not functioning in the Turkish maritime transportation industry at the moment, the proposition of the model constitutes a fruitful suggestion for practitioners in the field. The study also makes a contribution effort to the limited literature of VOs and maritime transportation.

The VIRTUA-L-CL model structured in this paper enables LCL cargo owners to find the required LCL service to different ports of the world from one system. By the help of this VO, they won't be sending separate e-mails to different LCL service providers in order to learn if they have a service to the port of destination they need to send their goods. The market research and rate research process will be extremely decreased. This will enable the shippers to strengthen their positions in agile and lean supply chains who may need part loads in small volume so as to keep stock levels low while meeting rapidly changing customer demands.

On the other hand the suppliers will be able to reach a vast amount of marketing power through this system. By removing the barriers of time and location through the use of a VO (Assimakopoulos & Theodosi, 2003) intermediaries will gain a serious cost advantage. The intermediaries need to invest in usual demand-generating activities such as promotional customer visits or customer calls. They also provide carriers consolidation of shipments and the discovery of available LCL capacity. They need to have specialized knowledge of individual carrier operations such as methods used to consolidate freight, contacts in ports and staging areas (Nault & Dexter, 2006). This model will enlarge the customer portfolio of intermediaries at a lower cost and for a lower marketing effort. By being able to discover more LCL capacity via this VO, the intermediaries will gain negotiation power against the carriers and obtain better freight rates. As suggested by Haas et al. (2007) networks of small companies are able to act like larger ones. Cooperation of SMEs will enhance their competitive power through giving them a virtual size. By being able to reach a vast amount of opportunity for co-loads through the system, the intermediaries will improve their service network which is a core competency in transportation business.

Turkish market has some early initiatives of VOs targeted towards the transportation sector but these generally focus on land transportation and have not gained much confidence yet due to the privacy concerns of logistics firms. Turkish transportation and logistics sector is at the stage of development and will pass to the phase of integrated logistics management

which requires a holistic point of view to the whole logistics processes in order to gain competitive advantage. Europe is the closest benchmark for Turkey to achieve this aim.

Together with the strategic geographical location between Asia and Europe, Turkey has a dynamic logistics infrastructure. Being on many of the international transportation corridors like Trans-European North-South Motorway (TEM) Project, TRACECA (Transport Corridor Europe-Caucasus-Asia) and Pan-European Corridor IV, utilization of the internet through the new structures of VOs for the acceleration purpose of the LCL market is assumed to contribute to the flexibility and responsiveness of Turkish transportation sector as a whole.

This study makes an attempt to design the overall model and the process flow of a VO for LCL transportation in Turkish maritime industry. However, it does not test a real life implication of such a model which constitutes a limitation. Future studies may develop an exemplary model and test it in LCL market to prove utilization efficiencies. Also, for a VO to be successful, it should be supported with Virtual Organizations Breeding Environment (VBE) (Afsarmanesh et al., 2009). In this study, the VBE part of this VO has not been explored. Future studies may empirically explore the Turkish LCL market and its propensity to create VBE or tendency to take part in such a VO.

One other future study suggestion is related with trust in VOs. Mazzeschi (2001) states that the parties that take part in a VO must have complementary roles, i.e. they should not be competitors. However, in VIRTUA-L-CL, the competitors will join the same network in order to utilize consolidation efficiencies and this may create a trust or conflict problem. Future studies may explore the conditions that would establish trust in such an organization.

Finally, the study proposes this model for the Turkish LCL transportation market which is a limitation for generalization purposes. However, LCL transportation is an international business so similar models may be applied to other countries that are engaged in large volumes of LCL traffic. The model can also be adapted by other transportation sectors like Less-Than-a-Truck-Load (LTL) markets which is essential for green transportation purposes especially in countries like Turkey where majority of domestic transportation is carried on roads.

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