WHAT SHOULD BE DONE FOR EUROPEAN RAIL FREIGHT TRANSPORT? A LOGISTICS PERSPECTIVE

Dewan Md Zahurul Islam, NewRail –Centre for Railway Research, Newcastle University, Stephenson Building, Newcastle upon Tyne, NE1 7RU, UK, Email: dewan.islam@newcastle.ac.uk, Telephone +441912223972

ABSTRACT

The objective of this paper is to examine the current state of European rail freight transport from logistics point of view and to suggest steps to be taken for making the European rail freight transport competitive. For this, this paper first discusses modern logistics and supply chain concepts. Then the current performance and reform measures of rail freight transport in Europe and the U. S are discussed. Finally, the paper suggests steps to be implemented.

Keywords: modern logistics, transport chains, rail freight transport, reform, EU, U.S.

MODERN LOGISTICS FOR SUPPLY CHAIN

Logistics is generally about adding 'place utility' to a product; for example, the product needs to be moved from one place in a country to another place in another country (Islam *et al.* , 2013; Langley *et al.*, 2008). The product could be a raw material to be processed i.e. for adding 'form utility' (thus will need supply or material management) in a factory, or semi-finished product from a factory in a country to be processed in another factory in another country for further value addition to turn into a finished product and then sold to many places in different countries that distributions (thus will need global distribution management). The movement of the product (its carriage terminology - goods or cargo) is known as freight transportation. During the transportation the product may need to be stored (i.e. warehousing element of logistics) adjacent to the factory or in a suitable place, may be in another country, for a certain period adding another dimension of logistics 'time utility'. Thus the factories get supplies from all over the world and after adding the 'form utility' the products are sold again in the global market place. In this process, Langley *et al.* (2008 p. 7) notes that the companies seek to rationalise their global networks and ask such questions as the following:

- *Where in the world should we source our materials and/or services?*
- *Where in the world should we manufacture or produce our products and/or services?*
- *Where in the world should we market and sell our products and/or services?*

- *Where in the world should we store and /or distribute our products?*
- *What global transportation alternatives should we consider?*

The questions noted above bring in an important aspect 'global' or 'worldwide' into the arena of supply chain. Inherently it also imposes some challenges including higher level of volatility of supply and demand due to varying ability and quality of different partners along the supply chain. For example, there are great variety in the transport infrastructure quality and ability in China and European countries (The World Bank, 2012) whereas they have to play significant role for the same supply chain to make it competitive. Also the volatility can be due to natural disaster; for example, the unprecedented Asian Tsunami occurred on 26 December 2004 in Indian Ocean, that interrupted many supply chain, although occasionally. To minimise the volatility, the modern logistics service providers, as supply chain partners, have important role to play by providing time- and cost-effective as well as reliable service. Competitive environment is an important essentiality to achieve such supply chain. Also the supply partners have to have resilience capacity to respond to such volatility. Many actors; such as transport chain actors, third party logistics service provider; port/terminal operators, port authority, Customs and border control agency; have to play their parts to achieve such service. Depending on factors such as product type (e.g. high or low value, time sensitive) frequency and size of shipments, distance, transit time and so on; the service options will be determined by the shippers or consignees. Considering the varying natures and contexts of the services there are varying definition of logistics, some are noted in Table 1.

Mangan *et al.* (2012, p.9) states that *Logistics involves getting* *--- the right product* *--- in the right way* *--- in the right quantity and right quality* *--- in the right place at the right time* *--- for the right customer at the right cost.*	Rushton *et al.* (2009, p.6) explains that Logistics concerns *the efficient transfer of goods from the source of supply through the place of manufacture to the point of consumption in a cost-effective way whilst providing an acceptable service to the customers.*
Defining logistics as *the process of designing, managing and improving such supply chains, which might include purchasing, manufacturing, storage and, of course, transport,* the CILT (2012) maintains that logistics service providers should aim *to deliver exactly what the customer wants - at the right time, in the right place and at the right price.*	Waters (2007 p. 2) notes that *logistics is the function responsible for moving materials through supply chain.* Waters (2007 p. 2) also notes that *a supply chain is the series of activities and organisations that materials both tangible and intangible – move through on their journeys from initial supplier to final customers.*
Langley et al (2008 p. 15) argued that *During the 1980s, the logistics or integrated logistics management concept developed in a growing number of organisations. Logistics, it its simples form, added inbound logistics to the outbound logistics of physical distribution.*	Langley et al (2008 p. 17) argued that *supply chain, demand chain, value network, value chains, etc. can be used as synonyms.* Langley et al (2008 p. 17) notes that supply chain management (SCM) *is the art and science of integrating the flows of products, information, and financials through entire supply pipeline from the supplier's supplier to the customer's customer.*

Table 1. Varying definition of logistics and supply chain

From the above discussion, generally logistics can be understood as:

> Logistics = supply of raw materials from global suppliers to a factory (inbound logistics) + materials management in a factory + global physical distribution to customers or customer's customer (outbound logistics).

The varying definitions are due to the varying scope and understanding of logistics where concepts such as just-in-time (JIT), push and pull concepts and practices. A buyer may buy a product in a big lot for once in a month or every week in a smaller lot and this decision influences the level of inventory the buying company has to maintain. To determine the optimal size of the inventory level, the concepts such as JIT or 'pull' technique can be applied meaning that the buyer will receive the product only when it is needed. This concept aims to have an effective inventory level of "zero" or "near zero" to eliminate/reduce the inventory cost (including capital and interest), although it may require frequent and smaller shipments size meaning higher transport cost. It will require higher level of reliability of transport service as well. In contrast the traditional approach is the 'push' technique where, the buyer will buy the product a bigger lot and will maintain a certain level of inventory (involving capital and interest cost) requiring warehousing facility and thus involve warehousing cost (such as rent, lighting, heating, security etc.). In this case, the transport can be cheaper, slower and probably less reliable transport service will be acceptable to the buyer. Table 2 summarises characteristics and suitability of three transport modes: road, rail and waterways. Without being too definitive, the author thinks that short, medium and long distance can be in the range of up to 200km, 200 to 400km and above 400km respectively.

Transport Mode	Distance	Transit time	Transport cost	Reliability	Emissions	Door-to-door service
Road	Short	Essential	Low	Very high	High	Excellent
	Medium	Suitable	Medium	High	Medium	Excellent
	long	Not suitable	Not suitable	Low	Very high	Not suitable
Rail	Short	Not suitable	Low	Not suitable	Low	Not achievable
	Medium	Moderate	Medium	Moderate	Low	Not achievable
	Long	Suitable	High	Low	Lower	Not achievable
Maritime and/or Waterways	Short	Not suitable	Not suitable	Not suitable	Not suitable	Not achievable
	Medium	Moderate	Moderate	Moderate	Moderate	Not achievable
	long	Most suitable	Excellent	Low	Lowest	Not achievable

Table 2. General characteristics and suitability of transport modes

From the above discussion it can be argued that there are many elements of modern logistics service including transport, warehousing, and inventory management. Considering the scope of this paper, the next section will focus on the performance and reform measures adopted for rail freight transport in Europe and the U. S.

RAIL FREIGHT TRANSPORT IN EUROPE AND THE U. S.

The total goods transport within the EU27 in 2010 were estimated at 3831 billion tonne kilometres (btkm) which includes intra-EU air and sea transport but does not include transport between the EU and the rest of the world. Of this, road transport accounted for 45.8%, intra-EU maritime transport for 36.9%, rail for 10.2%, inland waterways for 3.8%, oil pipelines for 3.1% and intra-EU air transport only accounted for 0.1%. Over the period of 1995 to 2010 (see Figure 1), the total freight volume has increased from 3060 btkm to 3831 btkm (a total of 25.2% growth). Over the period road freight transport volume has increased from 1289 btkm to 1756 btkm (a total of 36.2% growth). In contrast, the rail freight transport has merely (0.1%) increased from 386 btkm to 390 btkm over the same period (European Commission, 2012).

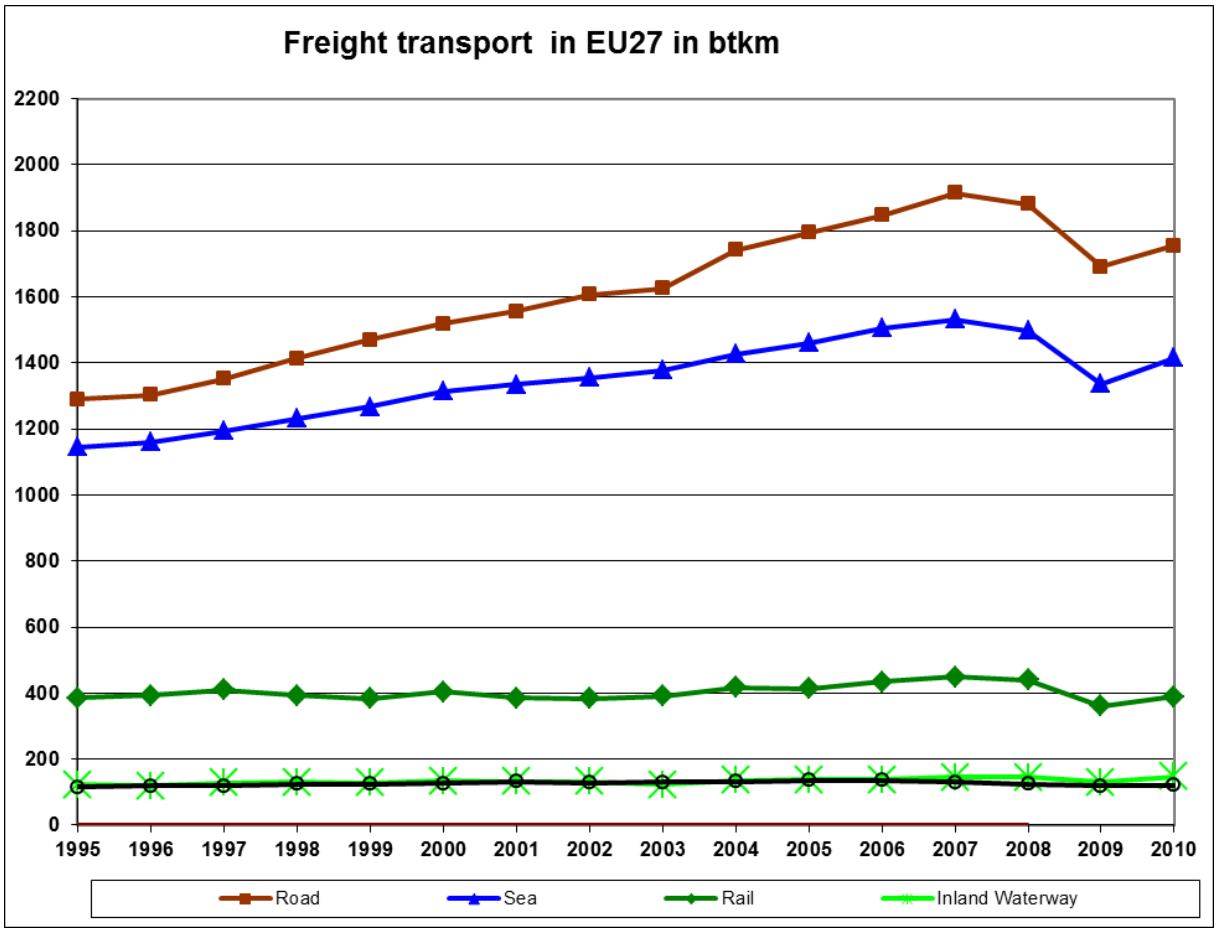

Figure 1. Freight volume of different transport modes in EU27 over the period of 1995- 2010 (European Commission, 2012).

To increase market share through improved competitiveness and efficiency, the rail freight transport ownership and operation have been massively reformed, from a command economy to a market-based, open, competitive one, through a series of Directives, since 1991, and through three Railway Reform Packages. Zunder *et al.* (2013) suggests that the Railway

Directive 91/440/EEC of 1991 was an important turning point for rail liberalisation in Europe. Subsequently the reform packages were issued to transform the state owned and operated European national railways (both freight and passenger) into commercial companies so that they can compete with each other (i.e. intra-rail competition) in a free and fair market. Also the European rail freight market becomes free for the new entrant private operators. Ultimately they (both incumbent and new entrant operators) can compete with other modes for example road. One important objective of the European rail liberalisation was and still is the separation of infrastructure managers from the operation of services so that the infrastructure manager play a fair and independent role, in terms of charging, easy access for new entrants, anti-competition practices, for both incumbent as well new entrant operators.

From 1 January 2007, the European rail freight market is ostensibly a free market, where both incumbent and new entrant operators are able to compete on every line and in every EU Member State (CER, 2006 p.7). But so far it is true that the reform is not performed in all countries uniformly, as was expected. Some countries (e.g. the UK) went for full implementation of the reforms (e.g. complete separation of infrastructure and operation) while some other countries are in opposite end (IBM 2011, p. 15). Railway Gazette International (2013 p.8) reports that the European Court of Justice found that Hungary and Spain failed to comply with the obligation of separating infrastructure manager from train operator, as per the First Railway Reform Package. The Court also found that the state railway holding company models in Austria and Germany complied with the legislation. The Lloydsloadinglist.com (2013a) reports that Europe's two biggest state railways - Deutsche Bahn (DB) and SNCF have locked horns accusing each other of unfair competition in the rail freight market. Also Lloydsloadinglist.com (2013b) reported that DB Schenker's French rail freight subsidiary - Euro Cargo Rail (ECR) has made another claims that rival operator Fret SNCF, subsidiary of French state railways SNCF, is engaging in anti-competition practices. ECR claimed that the rival is still offering below-cost rates, despite hefty fine by rail regulator in 2012. Followed a complaint lodged by ECR in 2009, Fret SNCF was condemned in December 2012 for a number of commercial practices that were designed to hinder and delay the arrival of new market entrants into French rail freight market.

The above examples of complain remind the fact that in reality some national infrastructure managers (and/or regulators) in Europe are not separated from the operations and the absence of a truly competitive market is probably one of many important reasons that the share of rail freight remained flat, despite these reform initiatives, directives, reform packages and warnings from the European commission. The European Commission (2013) issued Fourth Railway Package on the 30 January 2013 with the focuses, among others, on the clear separation of infrastructure from operation; facilitating the entrance of new operators; and rail authorisation and safety certification through one single authority - European Railway Agency (ERA) instead of individual Member States to improve competitiveness and quality of service and to reduce bureaucracy. Berkeley (2013) thinks that the Fourth Railway Package has turned into a German Railway Package for Europe that allows state railway holding company model. Berkeley (2013) apprehends that this will permit 'the hidden transfer of funds from the infrastructure manager via the holding company to the commercial activities of train operators, placing them in a competitive advantage over their competitors who do not

benefit from such aid. ---- By failing to provide full separation between infrastructure managers and railway undertakings, it will allow confidential information as well as funding to flow undetected between these companies, again to the detriment of fair competition.'

Brewer (1996 p. 92) opines that 'it is possible to get the benefits of competition without the requirement of a large number of competing firms'. This is true in the case of intra-rail competition, as there is always some sort of oligopoly in such services as rail freight transport, as only a few rail operators can operate on a route or corridor, although they are subject to competition with other modes, in particular road. Thus the rail freight operators have to gain ability to compete with other modes by offering, among other differentiators, competitive services with higher reliability and lower prices. In the case of other (than rail) modes the infrastructure managers (e.g. Road Highway Agency) are separated from the operations (e.g. road haulage) to ensure a competitive and contestable market for all. Brewer (1996 p.93) suggested the requirements for a contestable market including market entry and exit is costless; entry involves very small or no sunk costs; all firms (incumbent and new entrant) should be subject to the same regulations; pricing practices of the market must prevent the use of responsive pricing by the incumbent operators. These conditions are in focus in the Fourth Railway Reform Package, noted before.

In a comparative scenario, the rail freight transport in the United States (U. S.) has been performing much better. It can be noted that the operational as well as ownership in the U. S. is much different than that in Europe. For example, the American railways (known as railroads) were and still are owned and operated by private sector. They operate in a competitive environment, although there are complains of monopoly that some freight operators charge a higher rates as the customers (shippers/consignees) have access to probably only one rail freight operator. Also the transport haul is much longer than that in Europe. Anyway, the total volume of goods transported has increased from 4162 btkm in 1990 to 5866 btkm in 2007 (about a total of 41% growth). Of this road transport has increased from 1239 btkm in 1990 to 1922 btkm in 2007 (a total of 55% growth). During the same period the railways had achieved a higher increase (a total of 70% growth) from 1554 btkm in 1990 to 2656 btkm in 2007 (European Commission, 2012).

Many people see the U. S. railways as a success story. Spychalski and Swan (2004 p. 165) suggest that three reform measures: Railroad Revitalization and Regulatory Reform Act of 1976 (4R Act); Staggers Rail Act of 1980 (SRA); and Interstate Commerce Commission (ICC) Termination Act of 1995 (ICCTA); have downsized as well modernised the U. S. rail freight industry. This has resulted in reduced freight rates and dramatic improvements in productivity. Figure 2 displays the effects of reform measures on US railway industry. Spychalski and Swan (2004 p. 177) concluded that the success was achieved through the termination of money-losing services, use of more modern and efficient equipment, flexible work rules, and reductions in employment, rather than through structural change in the industry, unlike that in Europe. Levinson, (2005 p.261) reports that 'Trucks and railcars that had often been forced to return empty were able to get cargo for backhauls. -- -- . For the first time, railroads and their customers could negotiate long-term contracts setting rates and terms of service. ---. Freight transportation within the United States was reshaped dramatically.

Costs fell so steeply that by 1988, U. S. Shippers – and, ultimately, U. S. consumers – saved nearly one-six of their total land freight bill'. The Economist (2013) reported that 'Before deregulation America's railways were going bust. The return on capital fell from a meagre 4.1% in the 1940s to less than 3% in the 1960s. In 1970 the collapse of the giant Penn Central caused a huge shock, including a financial crisis. By 1980 a fifth of rail mileage was owned by bankrupt firms. Rail's share of intercity freight had slumped to 35% from 75% in the 1920s.'

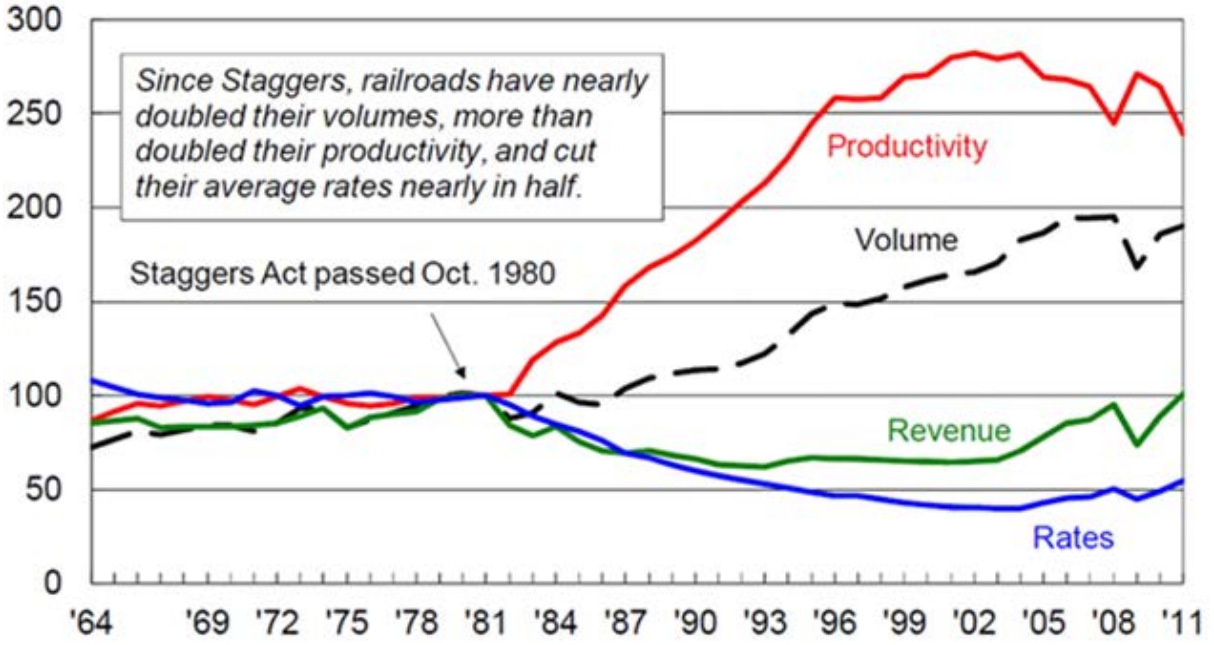

Figure 2. U. S. railways performance since Staggers Act 1980 (1981=100) (Association of American Railroads, 2013)

WHAT CAN BE DONE FOR EU RAIL FREIGHT INDUSTRY?

European rail freight industry can't copy the reform measures implemented in the U. S., as there are different background, necessity and context, although lessons can be learned. The European Commission has adopted many reform measures that have liberalised the market to a certain degree, but that is not good enough to make it efficient and competitive. Taken together the recent rulings from European Court of Justice and complains noted before, it may be suggested that some incumbent rail freight operators are not working as an independent company. They have close links with the infrastructure managers that distort the market which is hampering the progress of building competitive European rail freight industry. Taking the lessons of previous reform measures, the European Commission need to address the issue by a clear set of rules, removing any loopholes, with implementation deadlines and responsibilities. Until then, there is a little hope of dramatic change that took place in the U.S.

Generally an efficient, effective and reliable logistics service requires a door-to-door transport service that can be fulfilled by a number of transport chain actors. Depending on many factors; including distance between the origin and destination, shipment size, frequency of shipment, cargo type (e.g. time sensitive - flower, high value - automotive parts, low density - toilet papers, insulation materials) the transportation function can be performed by a uni-modal (e.g. only by truck) or multimodal system (e.g. road + rail + road). A multimodal transport is not just involvement of two or more modes of transport. Islam *et al.* (2005 p.384) thinks that 'Multimodal transport includes carriage by at least two different modes and international multimodal transport covers the door-to-door movement of goods while under the responsibility of a single contract'. Thus the rail freight transport has to be integrated to this door-to-door service. It has also to be a part of the single contract for the service. But so far rail freight operators offer shuttle service, in most case as a segment of the total service, between two terminals that is rarely a door-to-door service.

Another aspect of current European rail freight transport is its customer base of big shipments (for example, transport of coal for a power plant) as well as voluminous and low value cargo whereas the small and medium size enterprises (SMEs) form a significant portion of total freight volume. The rail freight operators have failed to include these SME customers in their customer base. It is not too difficult to include them in their customer list. They can do so, for example, by taking services of freight forwarder, a third party logistics (3PL) service provider. Islam *et al.* (2005 p.387) thinks that 'A freight forwarder is not usually a carrier but an intermediary between cargo interests and the carrier, who arranges goods carriage from origin to destination, but does not undertake carriage or accept liability as a carrier'. Another approach can be forming an alliance and partnership with the trucking companies for last mile solution or pick-up from the origin and delivery service to the destination. The third approach, complementary to the alliance and partnership approach, can be to extend its arms by having own trucking fleet in different major cargo origin/destinations. Scheduled rail freight services can be operated between two hub terminals by having consolidation service centres (CC) in the rail terminals (see figure 3). The CC can be public (for multiple) or dedicated (to one) freight forwarder(s) or be run by the extended arms of rail freight operator.

Morlok and Spasovic (1994) found that despite its relatively short distance compared to the rail movement, drayage (trucking portion) accounts for a large fraction of intermodal (or multimodal) origin to destination costs and is a major factor in service quality as perceived by the shipper. Morlok and Spasovic (1994) suggested that by redesigning the total operation, substantial cost savings can be achieved. The development of door-to-door rail multimodal service is in progress. For example, DB Schenker Logistics (2013) states that 'as a specialist in European land transport, both by road and rail, DB Schenker Logistics connects all of the important economic regions in over forty European countries via a dense network of regular scheduled services.' Other rail operators can follow such steps.

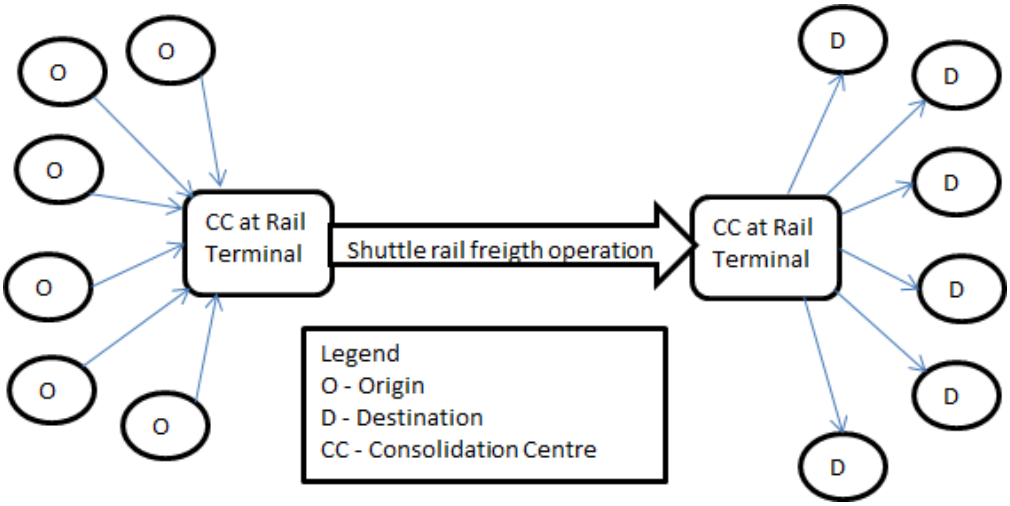

Figure 3. Rail multimodal (with shuttle) freight transport operation for door-to-door service

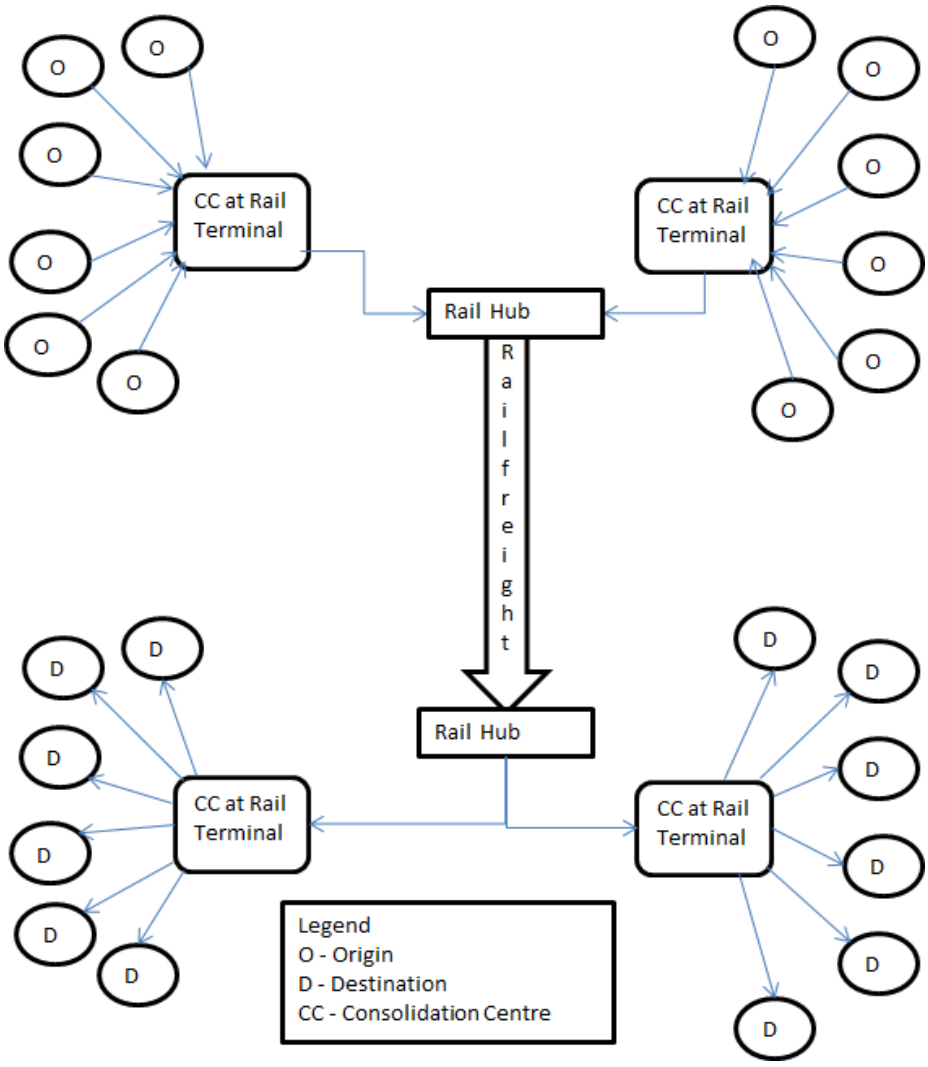

Figure 4. Rail multimodal (with feeder and shuttle) freight operation for door-to-door service

Final approach can be consolidating or bundling of single wagon load (SWL) and group of SWLs, although not a new concept, from the feeder line to the rail hub and then operation of scheduled service between two hubs (see Figure 4). The feeder line operators will receive consolidation services at the CC at rail terminals. RETRACK rail freight operator operated such SWLs and group of SWLs applying a hub and spoke model (Zunder et *al.*, 2012; Islam, et *al.*, 2010), although without consolidation services accommodating SMEs and their customers traditional big rail customers.

REFERENCES

Association of American Railroads, 2013, retrieved from www.AAR.org

Berkeley, T., 2013, Germany rewrites the Fourth Railway Package, International Rail Journal, 05 February, retrieved on 11/04/2013, http://www.railjournal.com/index.php/blogs/tony-berkeley/germany-rewrites-the-fourth-railway-package.html.

Brewer, P. R., 1996, Contestability in UK rail freight markets: The economics of open access, Transport Policy, Vol. 3, No. 3. pp. 91-98.

CER, 2006, Competition in Europe's rail freight market, DVV Media Group GmbH Eurail Press, Hamburg, p.7.

DB Schenker Logistics, 2013, Profile of DB Schenker Logistics, retrieved on 10/04/2013 from http://www.dbschenker.com/ho-en/about_dbschenker_new/db_schenker_logistics/profile.html

European Commission, 2013, Press Release on European Railways at a junction: the Commission adopts proposals for a Fourth Railway Package, Brussels, http://europa.eu/rapid/press-release_IP-13-65_en.htm, last accessed on 11.02.2013.

European Commission, 2012, EU Transport in Figure: Statistical pocketbook 2012, Mobility and Transport, Transport Statistics, table 2.2.2; http://ec.europa.eu/transport/facts-fundings/statistics/doc/2012/pocketbook2012.pdf, last accessed 10.04.2013.

IBM, 2011, Rail Liberalisation Index 2011. Market opening: comparison of the rail markets of the Member States of the European Union, Switzerland and Norway. A study conducted by IBM Deutchland GmbH in collaboration with Prof. Dr. Dr. Dr. h.c. Christian Kirchner, Humboldt-University Berlin, Brussels, 20 April.

Islam, D. M. Z., Meier, J. F., Aditjandr, P. T., and Zunder, T. H., Pacec, G., 2013, Logistics and supply chain management, Research in Transportation Economics, Vol. 41, Issue 1, May, pp. 3–16

Islam, D.M.Z., Zunder, T. H., Zomer,G., 2010, The potential of a pan European rail freight service using hub and spoke model, International Journal of Logistics and Transport Vol. 4, Issue 2, pp. 21–30.

Islam, D. M. Z., Dinwoodie, J., and Roe, M., 2005, Towards Supply Chain Integration Through Multimodal Transport in Developing Economies: The Case of Bangladesh, Maritime Economics & Logistics, 2005, Vol. 7, pp. 382–399.

Langley C.J, Coyle, J. J., Gibson, B. J, Novack, R. A., and Bardi, E.J., 2008, Managing Supply Chain: A Logistics Approach, South-Western Cengage learning, 8 edition, ISBN-13:978-0-324-66267-2. Mangan, J., Lalwani, C., Butcher, T., and Javadpour,

R., 2012. Global Logistics and Supply Chain Management', John Wiley $& Sons, second edition, p. 7- 19.

Lloydsloadinglist.com (2013a), DB and SNCF in war of words, Wednesday, 10 April, last retrieved 10/04/2013 from http://www.lloydsloadinglist.com.

Lloydsloadinglist.com (2013b), New anti-competition complaint against Fret SNCF, 10 April, last retrieved 10/04/2013 from http://www.lloydsloadinglist.com

Mangan J., Lalwani, C., Butcher, C.T., and Javadpour, R., 2012, Global Logistics and Supply Chain Management, Weley Higher Education, 2nd edition, p.9.

Morlok, E. K., and Spasovic, L. N., 1994, Redesigning rail-truck intermodal drayage operations for enhanced service and cost performance, Journal of the Transportation Research Forum, Vol. 34. Issue 1, Publisher: Transportation Research Forum, ISSN: 1046-1469.

Railway Gazette International, 2013, Court ruling on separation, April. P.8.

Rushton, A., Oxley, J., and Croucher, P., 2009, The Handbook of Logistics and Distribution Management (Creating Success), Kogan Page, ISBN: 0749433655, September, p.6.

Spychalski, J. C., and Swan, P. F., 2004, U. S. rail freight performance under downsized regulation, Utilities Policy, Vol. 12, pp. 165-179.

The Chartered Institute of Logistics and Transport, 2012, at http://www.ciltuk.org.uk/pages/royalcharter, accessed on 02 August 2012.

The Economist, 2010, American railways: High-speed railroading, retrieved 11/04/2013 from www.economist.com

The World Bank, 2012, Global Ranking, International Logistics Performance Index 2012, retried on 26/03/2013, from http://lpisurvey.worldbank.org/about.

Waters, D., 2007, Global Logistics: new directions in supply chain management, The Chartered Institute of Logistics and Transport (UK). London; Philadelphia: Kogan Page Ltd., 5th edition, p.2.

Zunder, T. H., Islam, D. M. Z., Mortimer, P. N., and Aditjandra, P. T., 2013, How far has open access enabled the growth of cross border pan European rail freight? A case study, Research in Transportation Business and Management, Vol. 6, pp. 71-80.

Zunder, T. H., Islam, D. M. Z., and Mortimer, P., 2012, Pan-European Rail Freight Transport; Evidence from a Pilot Demonstration Result, Procedia: Social and Behavioral Sciences, Vol. 48, pp.1346-1355.