Example of research paper on transportation and network capacity

Transportation, Road

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Thesis Statement

The recent changes in economy, which appeared as a result of globalization, or emerging economic ones, among others, have affected the social rhythm and the business style for many people and companies entrenched in commercial activities or in traveling, as part of their lifestyle. These economic and social shifts impose significant demands on transportation within all types of modes (by motor and rail, by water, and by air), requiring for constant upgrades, so that the transportation means to be in accordance with the permanently demanding and competitive global economy. Such an aspect is related to capacity transportation. For better understanding this aspects and for identifying how the transportation industry adapted or needs to adapt to the dynamic globalization process and to the changing economy, this paper aims to answer by providing an in – depth presentation of the transportation issue, by analyzing the causes and impacts of the capacity in transportation, by examining the current changes to which the transportation industry needs to adjust and by proposing capacity solutions, pointing what needs to be changed in order to successfully implement capacity transportation solutions.

Transportation Issues

Basically, transportation plays a significant role in any economy, directly impacting the production processes as well as the conditions through which the trade is supported. Besides the infrastructure and architectural design of the streets, rails, roads, transportation also imposes capacity constraints. Off course, all these aspects differ and vary from city to city and from country to country, while the economic exchanges are implemented at a global level in the nowadays economy. This is where the challenge appears: having the sufficient resources and capacity to satisfy the demand, while being constraint by supply and network capacity.

Network capacity implies a complex process of aligning customer demand, supply chain, customer service, architecture, infrastructure and logistics, regulations and policies regarding transportation, in the context of a global economy, with increased demands, increased competition, and permanently changing regulations meant to protect the environment from the carbon consumptions utilized in the transportation process.

An open competition is sustained and enhanced through a network capacity system. Although different carriers, from competing companies or from different transportation modes are part of the same transportation network, they can also represent a stimulation for each other, for improving the customer services, the logistic, equipment or for investing more in research and development in order to become more productive, assuring competitive advantage. Like this, competitor companies become reliable partners, considering the fact that in a transportation network they might be a part of the same supply chain.

The nowadays economy imposes challenging demands for the carriers in all the transportation modes. This section explores the issue of network capacity’s impact on the existent transportation modes. While specific goods are better transported through a certain transportation mode, the transportation possibilities from the area from which the goods are picked – up, might not include the needed mode of transportation. This is why other transportation means should be utilized to carry the goods from the origin point to an intermediate point.

Studies state that the changing society comes with multiple other modifications that impact the movement of goods, domestically and internationally. As such, the changes that occurred, in processing, in technology, in communication and in the transportation methods imposed industrial structure changes. As world entered in the consumerism age, the transportation needs have increased, and the preferences of people have turned from the raw materials to the finished goods, making the shipment of the goods lighter in weight, hence faster and carrying high-value products, favoring the trucks shipment, which can adjust a higher speed (“ Burlington Northern Case”, 1989).

Referring to the developments that occurred in technology and communication, Bansat et al. observe that nowadays the global exchange is sustained through efinancial services, which imply exchanging documents necessary to various shipments and transportations in a viral mode, which contributed to the enhancement of the ecommerce. This global procedure, as well as others that emphasized the global business presence, was embraced by BRIC countries (Brazil, Russia, India, China), which increased

their trading interconnections, facilitated by the modern communication and technological means, as well as by the transportation that answered the increased economic specificities (2009).

Network capacity includes relevant data about transportation planning and management, analyzing whether a specific transportation system possesses sufficient capacity for answering the evolving economic needs and for managing the traffic congestion. Capacity refers to discussions regarding the network's elements: " links (rail lines, road segments, waterways, etc.), and nodes (terminals and signalized intersections, etc.) (Kasikitwiwat & Chen, 2005, p. 1439). However, as the authors also notice, the network capacity discussion in transportation is much wider, as it also implies references to water distribution or electric power systems (Kasikitwiwat & Chen, 2005), combustible consumption, actual space for managing the operations, including for handling the flow of goods and people.

Kasikitwiwat and Chen reflect on the aspect regarding the means and duration of the transportation of goods and state that during this process, there could be more origin – destination (O - D) points, constituted by the networking points (2005). And these O – Ds might link different modes of transportation, such as road with rail or with water or air. As Ambre observes, the potential of managing all these modes of transportation contribute to the backbone of a country's economy (2005).

Concerned with the system capacity, which is an indicator of the network capacity, Kasikitwiwat and Chen discuss about the economic and the physical capacity, whereas the economic capacity is an abstract construction that contributes to the theoretical understanding of the return of the

transportation process, and the physical capacity deals with practical operational procedures that sustain the production and inject the transportation flux (2005). The economic capacity defines the point where the marginal cost intersects the average total cost, while the physical capacity deals with the physical limitations of the production to indicate the maximum practical capacity that can be accomplished in the specific production limitations (Kasikitwiwat and Chen, 2005).

Other authors also refer to road capacity when discussing about transportation, where the road capacity defines the total number of users that utilize a certain road (Zhang & Levinson in Coto – Millan & Inglada, 2007) or to Terminus, Line and Junction Capacity (Ambre, 2005).

In transportation, network capacity includes, besides the actual considerations regarding the space needed for handling and carrying the traded goods, concerns about the type of vehicle needed for a specific package and the links between varied transportation means, fuel price or the eco tax, also aspects related to the infrastructure and the traffic regulations and safety administration. Vehicles operate under certain regulations (Coyle, Novack, Gibson & Bardi, 2011), established by different administrations, depending on the nature of their mode of transportation (by air, rail, road or water). They are responsible for setting up rules meant to assure proper circulation conditions, encouraging the competition between carriers that develop their activity in the same transportation mode or between transportation companies activating in different transportation means (from instance between a rail and a water career).

Likewise, administrators assure the safety of the circulation on different

circulation modes by monitoring and maintaining them in good circulation conditions, as well as by investing in research and development for improving the transportation conditions, contributing like this to the common economic development (Coyle, et al., 2011).

Costs of transportation directly impact the economic development in any regionals which is not economically limited to the domestic production, but engages in trades and exchanges with other regions, near – by economic poles, through the mediation of the transportation system. Coyle, et al. explain in more detail the connection between transportation and the economic mechanism. A good has differentiated prices, depending on the location from where it is purchased. In point A (where A is the location from where the good is being brought) the product has a certain price – x. Being transported at a distance of 100 miles, the transported good will also include the transportation cost, hence, it will value x + the transportation cost. Now, if on the supply chain there can be implemented a reduction of the transportation cost, of course, the landed cost of the good will decrease at the destination, proportional with the total saving earned. Considering that the sum of the transportation decreases by half from point A to the destination point (point B), and that the distance between point A and point B is 100 miles, the reduction (50% of the initial cost) can be utilized for covering yet another 100 miles, assuring the availability of the product also in point C, at 200 miles distance. This economic equation stays bands at the basis of defining the market area (Coyle, et al, 2011).

Notwithstanding, the role of supply chain is essential in transportation, wherein the partners belonging to the supply chain (from the same or a

different transportation segment) can be both supportive partners and competitors, nevertheless having as the common goal to support the economic growth, which would be beneficial for every link involved in the supply chain network.

As such, marine terminals are closely positioned to other transportation modes, in order for the cargo to be easily handled, but the origins of the cargos are not in their close proximity. Therefore, the cargos need to be transported to the vessels by trucks or on railroads. For managing this challenge of the long distance traveled by train or by truck to get to the vessel, several marine ports invested in on – dock rail lines, in order to create a direct line origin point to the port. In addition, there were also implemented investments in road connections to public highway as well as in technologies meant to improve the speed of cargo movement (Transportation Research Board Special Report 279).

For dealing with another challenge, the intense traffic, there were created the Panamax ships, which are the largest ships that can pass through the Panama Canal (965 feet long and 106 feet wide at the beam). Ships that are larger than these dimensions, cannot enter the Panama Canal. For this reason they are called post - Panamax and they exceed 100. 000 gross tons. The post – Panamax currently deals with operations that include cruise liners and cargos, being the biggest vessels of the moment. However, for answering the constantly changing and growing needs of commerce and economy, the marine traffic could be adjusted through building an even bigger ship, which should stretch on 1180 feet and span on 154 feet (Cruise Travel, 2007).

For attenuating the effect of distance, which is a challenge of the emerging global trade, there has been implemented a heavy concentration of containers in the largest ports. This situation is highly specific to the emergent Asian countries and the containers allow a standardized load unit with an increased performance. Nonetheless, the shipping price between Europe and Asia is much higher than by freight. The advantage is that the ocean shipping is reliable, regular and easy to control, while the maritime one is more heavy and the cargo reaches much later to destination, increasing the O-D time (“ Transport Links”, 2006).

The advantage of importing products lies in the fact that it encourages the competition, by making business with other partners, which may have more favorable prices, transportation included. The local supplier of the demanded good might impose monopolistic prices because it might be the single player on that market, or other similar players on the same market might impose the same range price, in order to maintain a fair competition. Nonetheless, the free exchange can impose dramatic changes upon the domestic producers/suppliers of the demanded goods, as they might be imported at a smaller cost. In this case, maintaining the same prices might cause the local suppliers and producers their business. Otherwise they would have to adjust to the market prices, imposed by the external suppliers. Hence, the role of transportation is essential for the economy stimulation and it is increasingly significant that the network capacity to be improved (Ambre, 2005).

For encouraging the economic development, organizations across the world take into consideration developing significant transport projects. As such, European Union invests in research and development for building new

section of road or railway, or combined rail – road transport terminals, ports or airports, upgrading the existing networks in the same time (European Transport Network, 2001).

Discussing about air transportation of goods, there can be still identified a restrictiveness in this transportation mode, from a regulatory framework point of view, not solely regarding the passenger transport, but also the goods transportation. Likewise, the prices for transportation of goods through this transportation mode are quite high. Nonetheless, for dealing with the challenge of regulatory restrictions, various regions are applying the open skies and free trade in air services. To keep pace with the increasing demand, many countries apply bilateral air services arrangements. Liberalization of air transport has contributed to reducing the cost of transporting for many goods, and this implies an increase in transporting goods by planes. However, there are still big differences between airports who can adjust more traffic, signifying a larger capacity for operating the transportation of goods, and airports who lack the logistic possibilities for assuring an intense air transportation of goods (Findlay, Chia &b Singh, 1997).

As for the railway transportation, the high speed trains (HST) are a solution that was identified to the problem of slower speed in transportation in the railway than in the road transportation. Germany’s project “ Network 21” is designed to creating a freight train network, wherein the operations are not interrupted by passengers movements (OECD, 2008). The HST are traveling globally, covering extensive areas in consolidated and emerging economies as the BRIC countries, reaching impressive speeds, because of the

technology which was invested in designing the rail ways and the trains.

As discussed in the beginning of this essay, network capacity is a complex system that needs to align various aspects and considering that in the transportation field there are multiple suppliers that need to be considered, they all have to follow their common goal, of increasing the productivity. Any major change in one of the partners included in the supply network chain will directly affect the others' performances. As such, increasing the oil and gas prices will significantly influence the transportation by road, as the road transporter will have increased combustible consumption. With an increased consumption, the transporter will also have to impose higher prices for the transported goods, which will generate a higher landed cost.

Within an evolving economy, adjusting and anticipating how its changes might impact the transportation network capacity is significant. The players activating in the transportation sector need to be consistent with their supply chain network in order to obtain together improved results, for reducing the impact that certain sudden changes (such as increasing the oil and gas prices) might impose on them and for pursuing an open economic environment, through adjusting their network capacity.

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