# Managing Supply Chain Risk that is Beyond Control at the Individual Firm Level: The Logistics Perfect Storm as an Example

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**Abstract.** Efforts to reduce supply risk often focus on attempts to avoid price increases or prevent supply disruption by working with suppliers. However, substantial risk can accrue from challenges and failures with their roots, not in the supplying firms, but in the broader business environment, such as general economic conditions, socio-political conditions, industry conditions, and risks associated with the linkages between firms. In such cases, traditional approaches to the management of supply chain risk may have little impact on the extent of risk exposure that the firm faces. This proposal focuses on one example of such risk rooted in current challenges found in our transportation networks required to move goods from the suppliers to the purchasing firm. A study of the feasibility of facilities intended to streamline processes within the transportation networks serves to develop themes that can be applied to ameliorating risk in many situations where supply chain risk results from features of the environment outside the control of the focal firm or its individual suppliers.

**Introduction.** Supply chain risk has generally been defined as the potential occurrence of supply events that may have significant detrimental impact on the purchasing firm (Zsidisin 2003, Ritchie and Brindley 2007). Instability in the world coupled with increasingly sensitive supply chains has caught many organizations off guard. Thus exposed to risk, organizations have shown heightened interest in rethinking supply chain management practices (Wagner and Bode 2008). Risk reduction can be accomplished by actions that either reduce the likelihood of potentially negative events, or reduce the extent of negative impact should such events occur (Zsidisin and Smith 2005). However, a major challenge to instituting such actions may be in finding the means to control events that can actually be implemented by the supply management professional. One can readily see that a supply chain manager can institute internal action or influence the actions of critical suppliers, but if risk is the result of factors beyond the control of the focal firm or its suppliers, supply chain risk management becomes a very challenging proposition.

In characterizing sources of risk, Peck (2005) envisioned supply chain management as interacting along four levels. Of particular importance for the purposes of this paper is that at the highest level, broad environmental factors existing in the macroeconomic and natural realms interact with all other supply chain activities. Thus, broad economic, social, political, technological and natural phenomena interact with our attempts to manage the intra- and inter-firm flows necessary to create value in the business environment. Although forces at this highest level are beyond the control of any given firm, they potentially determine the success of all of the efforts, no matter how well conceptualized or executed, at the lower levels that

include the management of flows within the value stream, the positioning and utilization of assets, and the conduct of business.

Another view highlights a lack of supply chain confidence resulting from increased risk exposure. Having little confidence in such critical events as order cycle time, demand forecasts, supplier delivery capability, quality and transportation reliability all foster risk-averse responses. Safety is sought in increased safety stock, but also by building in safety lead time. Users order substantially sooner than is necessary so that they have confidence in delivery in spite of variable performance within the supply chain (Martin and Lee 2004).

When one considers the critical nature of material flows within the supply chain, it should be clear that effective transportation is critical to the success of many businesses. Recent reports are clear in pointing to increasing logistics costs, and transportation costs have been a major portion of the increased costs. In 2007, according to the Council of Supply Chain Management Professionals (CSCMP), logistics costs increased to 10.1% of the U. S. gross domestic product (GDP, up from 9.5% in 2006), and transportation costs increased to 6.2% (up from 5.9% in 2006) (Burnson 2008b). As readers can readily extract from personal experience, volatility in fuel prices contributes a substantial measure of uncertainty to transportation costs, thus, increasing uncertainty regarding pricing in the supply chain. While the current global economic condition has resulted in a relaxation of the upward pressure on transportation costs, the long term concern remains.

Indeed, failures in transportation networks can lead to non-delivery, increased lead times, uncertain lead times, increased prices for delivered products, damage, and of course, increased inventories as managers invoke buffer strategies to deal with the other challenges. We turn now to a description of three additional forces that are creating challenging situations in our transportation networks.

**The Logistics Perfect Storm.** The confluence of increasing and shifting demand, capacity constraints and failing infrastructure are leading to what has been called a logistics perfect storm (Buddress and Smith 2008). Growing trade and changing patterns in trade as we experience economic turbulence are having the effect of increasing pressure on logistics assets and making prediction of logistic performance difficult. Projections of freight volumes may vary, but there is one consistent theme; everyone agrees that we will see considerable growth in freight volumes in every mode of transportation. According to U. S. Department of Transportation projections, we may well see doubling of tonnage moved on highways and by rail, and much greater increases in movements through seaports (Schmitt 2006). The Air Cargo Management Group projects that air cargo will triple by 2023 (Thuermer 2006). Even with a slowing economy, growths in population will require substantial movement of goods, and as the economy recovers, we undoubtedly will see the movement of goods increase. With economic turbulence, we have also seen significant reversals in transportation flows, a state of affairs that is fluctuating rapidly as we see dramatic shifts in the monetary markets (Burnson 2008a).

In the face of such growth in demand, constrained capacity across all modes of freight transportation makes effective management of the movement of goods a daunting task. From overwhelmed sea ports (Gallagher 2006) to driver shortages in trucking (Hannon 2006), to constraints in rail capacity (Atkinson 2008), we simply do not have adequate transportation to

meet current and future needs. Further, attempts to address shortages in one mode often result in compounding of the problems faced on another mode as when trucking firms utilize the railroads to address problems in trucking, only to magnify the problems that the railroads face. Finally, it is clear that capacity limitations are not subject to simple remediation, since in each mode of transportation the limitations come from multiple sources, but perhaps the most critical limitation is presented by our failing transportation infrastructure (Engler 2007).

The U. S. faces stiff competition in the global marketplace, and we are undertaking this contest from a disadvantageous position given that our engagement in trade is hampered by inadequate infrastructure (Krohe 2008). We have failed to make the required investments in maintaining our infrastructure, and the result has been that it is simply not satisfactory given our needs. The American Society of Civil Engineers (ASCE) surveys its members periodically (the period between surveys has varied between three and four years) regarding the state of the Nation's infrastructure. For the most recent survey (2009, http://www.infrastructurereportcard.org), the results are dismal. The overall grade was a D. In the transportation realm, roads received a D-, with bridges receiving a C; rail infrastructure received a C-; aviation received a D; navigable waterways received a D-; and over time, the grades have shown continued deterioration. Overall, the ASCE has determined that there is a need for an investment of $2.2 trillion over a five-year period to bring the state of our infrastructure to good condition (in the previous 2005 survey, the amount needed to bring the infrastructure to good condition was $1.6 trillion over a five-year period).

The aforementioned CSCMP Annual State of Logistics report contained the following telling concluding statements that reinforce the ASCE conclusions:

- 2006: "Capacity (workers, infrastructure and equipment) is not keeping pace with growth in volume."
- 2007: "Everybody understands something has to be done about the infrastructure and everybody has to be involved."
- 2008: "Our nation's transportation infrastructure is failing and will not meet our needs in the future."

The composite realization is that we have chronically underfunded our nation's infrastructure for decades, and now the bill is coming due.

These three forces, increasing and shifting demand, capacity constraints, and failing infrastructure are bringing severe turbulence to logistics. When coupled with volatile fuel prices, there can be little doubt that the movement of goods as needed by businesses has become challenging and risky. However, the sheer scale and magnitude of the sources of trouble in this realm are vastly beyond what any single firm can expect to influence. Just what can be done under circumstances where the major forces creating uncertainty are beyond the control of the focal firm or its suppliers? In the next section, we will describe research that seeks to address this concern in the context of transportation.

**Feasibility Study for Infrastructure-Based Remediation of Problems Rooted in Transportation Networks.** We now turn to description of a study that is examining the feasibility of an inland port to remediate trade disruptions based on challenges present in our transportation networks (Smith 2010). While the study was initially undertaken as part of an

economic development initiative, the results provide themes that are relevant to addressing supply chain risk in many situations where the focal firm and its suppliers are not able to exert significant control over the factors leading to such risk.

While the definition of an inland port varies substantially, for purposes of the study, attention has been directed toward features that impact supply chain risk. In particular, emphasis has been placed upon how a facility can serve to promote handling shipments away from traditional port of entry facilities, the transfer of freight between modes of transportation, and processing international trade. Thus, such a facility can be seen as potentially addressing cost and performance issues in linking firms in a supply chain by addressing constraints in dealing with transportation demand. Further, a well conceptualized facility of this sort should address issues in the infrastructure and fuel prices by promoting efficiency and the selection of transportation modes that are both relatively less impacted by infrastructure challenges within a particular corridor and less costly.

In order to examine the range of issues being addressed by such facilities, the features involved in various implementations, and how well these features address the current and future transportation challenges that impact trade, exploratory visits were conducted to a number of facilities. The facilities studied include both sea ports subject to many of the challenges to be addressed by an inland port, and inland ports, including Virginia Inland Port in Front Royal, VA; inland port facilities as part of the economic development activities in Huntsville, AL; a new rail park in Sommerset, KY; the Smart Port projects in Kansas City, MO; the ports of Los Angeles and Long Beach, CA; the developing Victorville Southern California Logistics Airport in Victorville, CA; the port of Stockton, CA; the San Joaquin Valley Inland Port in CA; and the port of Savannah, GA. Additionally, information was gathered from five facilities with varying levels of success in order to create a profile of the differences between successful and unsuccessful facilities. Finally, a number of meetings with local business groups served to highlight alternatives to facilities in dealing with transportation challenges.

From the data gathered, themes were extracted relating to placement, demographics, transportation requirements, freight flows, workforce development, infrastructure requirements, and a number of specific requirements for public and private engagement in order to support potential success for an inland port. However, with respect to risk management, a number of themes emerged. We now turn to describing how these findings can be applied to general considerations of how to mange supply risk from sources beyond the control of the firm, such as supply risk resulting from within our transportation networks.

**Traditional Approaches Fail when Managing Supply Risk that is Beyond Our Control.** With challenges as great as those present in the current state of transportation, traditional supply risk management efforts are destined to fail. Behavior-based management (Zsidisin and Ellram 2003) may work very well in dealing with risk that is based in a supplier or in its management of its suppliers. However, we would not expect such efforts to be effective when the risk was not essentially independent (i.e., not shared with other organizations). Note that problems such as those present in transportation networks are shared, much as is the case for industry risk and other situations where the risk affects the entire supply base or major segments thereof. Managing instances of such risk as if they were isolated circumstances will prove ineffective and wasteful of management resources.

The other major form of supply risk management, the buffer-oriented approach (Zsidisin & Ellram, 2003) may indeed protect the firm by limiting the extent of damage. Note that when inventory is increased either with the supplier or the focal firm, the reduction in damage may be substantially offset by the costs associated with increased inventories. Another limitation to buffer-based risk management approaches can be found in recognizing that for the class of large, multifaceted risks being addressed in this paper, the risk is shared, and advantage may not accrue to using multiple sources except in the very limited condition where differential exposure can be found to the general risk. This limiting condition is addressed, for example, when a firm uses local suppliers to limit the extent of transportation-based risk.

**Managerial Implications.** Managing the class of supply chain risk that is present in the logistics perfect storm requires coordinated efforts beyond the level of the individual firm. Therefore, collaboration is essential in the face of a significant portion of the supply chain risk that firms face today. In many cases, this collaboration may involve parties that today's businesses tend to shun.

In logistics, the required aggregated action may include coordinating shipments with other businesses and even competitors. Consortia or alliances may be an essential part of such efforts. For example, the Asheville (NC) Area Chamber of Commerce (2010) has worked with manufacturers in the western North Carolina region to facilitate the establishment of the Western North Carolina Transportation Alliance (WNCTA) that functions to promote exchange of shipping information between member businesses. This exchange of information has led to cooperation that has begun to see success in ensuring full utilization of transportation assets, as well as emerging approaches to dealing with other challenges associated with the movement of freight today.

For efforts such as those described above to work, collaboration has to function across traditional boundaries, including local political boundaries in many cases. Note also that there is a real need for facilitation, and governmental bodies are often well positioned to provide resources if we can move toward public-private partnerships. Such partnerships may be particularly critical given limitations in capital resources. In today's environment, public initiatives will require private investment if they are to have any realistic chance of coming to fruition.

Another aspect of collaboration to address problems that cross boundaries is that such collaboration does not always require infrastructure. In an era of tight resources, better coordination may be much more likely if we can facilitate the coordination through virtual means. Thus, in the case of the logistics issues, if a virtual freight coordinating effort can be established, it is far more likely that the resources for a few staff to manage such an effort can be obtained than is the massive infusion of capital required for a facilities-based effort.

Finally, since most of the shared sources of risk can only be addressed by efforts that extend beyond the constraints imposed by business, political and geographical borders, it is critical that we engage resources beyond the local level. Almost all solutions require at least a regional focus, and many require national attention (and we may really need to look for international solutions in many cases). In seeking resources to extend our efforts beyond immediate boundaries, we will need to effectively bring pressure to bear at the highest levels. Business interests must begin to band together to influence governmental processes. For

example, with respect to the infrastructure issues involved in the logistics perfect storm, if the tendency to lobby federal legislatures from the perspective of a particular industry could be eschewed in favor of a concerted effort to gain investments in improving our infrastructure generally, we would be much more likely to see meaningful investments to support future national success in competing in global trade. Likewise, in seeking regional solutions to transportation challenges, most efforts must include interests in surrounding states.

Ultimately, supply chain risk management is substantially about solving or ameliorating those really big problems that extend well beyond our immediate control. Thus, making progress toward effectively managing the largest sources of supply chain risk will require that we begin to think beyond immediate actions and evoking collaboration beyond the confines of our immediate supplier relationships.

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