



Global Supply Chain Risk Briefing

How globalisation and unbundling of production has altered the balance of supply chain risk

June 2012

Report Code: TIWPGSR1206

About Transport Intelligence

With offices in Europe, North America and Asia, Ti is a market leading provider of expert research and analysis dedicated to the global logistics industry. Utilising the expertise of professionals with many years experience in the mail, express and logistics industry, Transport Intelligence has developed a range of unique web-based products, reports, profiles and services used by all the world's leading logistics suppliers, consultancies and banks as well as many users of logistics services.

For more information on all Ti's products and services, visit www.transportintelligence.com or contact Mike Nordmann on telephone: +44 (0)1666 519900 or email: mnordmann@transportintelligence.com

Global Contract Logistics 2012

This whitepaper on Supply Chain Risk has been taken from Ti's annual report, Global Contract Logistics 2012. The report contains analysis of developments and trends in the supply chain sector and includes:

- Company Rankings & Shares—2011 market rankings and shares for the largest players in the sector on a Global, European, North American and Asia Pacific basis.
- Market Sizing & Forecasts—an insight into the size and growth of the global contract logistics market, breaking the data down into many individual regions and countries.
- Company Profiles—over 20 operational and financial profiles of the world's largest players including, DHL, DB Schenker, Ryder, Wincanton, Penske, Schneider, Kuehne + Nagel and Toll.

All rights reserved. No part of this publication may be reproduced in any material form including photocopying or storing it by electronic means without the written permission of the copyright owner, Transport Intelligence Limited.

This report is based upon factual information obtained from a number of sources. Whilst every effort is made to ensure that the information is accurate, Transport Intelligence Limited accepts no responsibility for any loss or damage caused by reliance upon the information in this report.

Contents Page

About Transport Intelligence.....	2
Contents Page	3
1.0 Global Supply Chain Risk	4
1.1 Rebalancing ‘external’ and ‘internal’ risks.....	4
1.2 Quantifying supply chain risk	7
1.3 Types of supply chain threat	8
1.4 Unknown unknowns... ..	11
1.5 Sector resilience to threats.....	13
1.6 Examples of Supply Chain disruption	14
1.6.1 Natural Disasters	14
1.6.2 Conflict and Political Unrest.....	17
1.6.3 Economic/Demand shocks	17
1.6.4 Terrorism and piracy	19
1.7 Conclusion	22
1.8 Bibliography	23
Contact Transport Intelligence	24

1.0 Global Supply Chain Risk

1.1 *Rebalancing 'external' and 'internal' risks*

External threats to supply chains have received considerable attention following the well-publicised natural disasters in Japan and Thailand. However understanding of these risks is at a very early stage. One survey, undertaken for the World Economic Forum, found that 30% of respondents estimated losses of 5% of annual revenue from supply chain disruption. However over a quarter of respondents were not able to place a figure on the financial impact of a disruption.

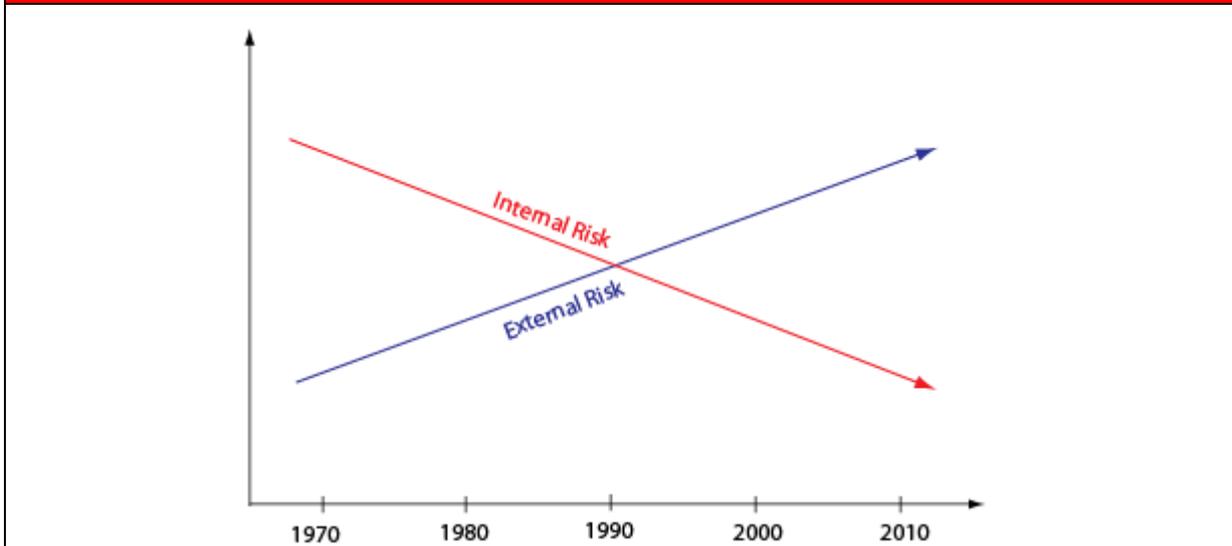
It is not that the risks themselves have become more acute. After all there have always been wars and natural disasters. Rather it is the evolving supply chain and production strategies of the major global manufacturers which have changed, leading to a rebalancing of the risks inherent within various parts of the supply chain.

One distinction which can be made is between 'internal' and 'external' risks. For example, in the 1980s the personal computer sector adopted traditional manufacturing practices involving the outlay of huge amounts of capital.

The risks were clear as many of these companies quickly went out of business when their forecasts proved hopelessly wrong. From this period new business models were developed which allowed manufacturers to focus on design and marketing and let their supplier bear the risk of production.

This process has been referred to as 'unbundling' of production. In other words, in this example, 'internal' risks were out-sourced to Contract Electronic Manufacturers. This, however, did not leave the OEMs risk free – rather the 'internal' risks were transformed into 'external' i.e. those which are inherent in extended supply chains. The risks have changed but are still there and are just as business critical.

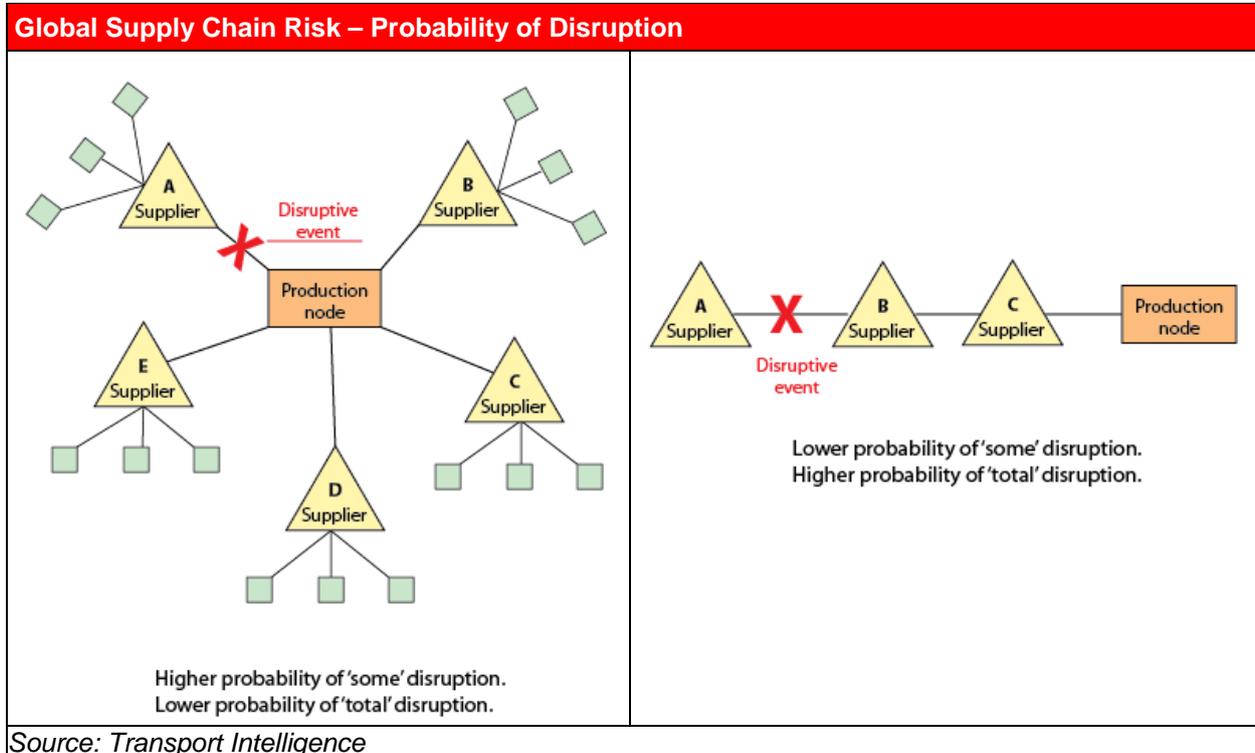
Global Supply Chain Risk – Internal & External



Source: Transport Intelligence

The 'un-bundling' of various production processes has led many OEMs to evolve into what are, in effect, managers of integrated and complex networks of remote but interlinked suppliers. In some cases this has produced greater levels of risk, and in others it has had the opposite effect. There is no doubt that extended supply chains are more vulnerable to external threats, but on the other hand, such networks have also dispersed risks to a number of markets by reducing centralisation.

A small supply chain, for instance, with a single production facility is highly vulnerable to external events whereas a large, complex supply chain with multiple supplier options has the potential to be much more robust through a greater number of sourcing options. Each option may have higher supply chain risk attached although – and this is the key point – the probability of overall network disruption is less than in a small supply chain (see chart below).



The move towards more complex supply chains has its own risks, related to a reduction of visibility and the development of sub-optimal networks. With Asia transforming from a production market to a consumer-led economy, this will only add extra layers of complexity into sourcing and out-sourcing decisions for Western manufacturers. Timeliness, reliability, information sharing, quality and design, along with wider benefits resulting from shared labour skills and knowledge all need to be weighed along with levels of visibility, management control and of course external risk.

Globalisation has brought its own risks. Extended supply chains mean longer lead times (and less agile response to market conditions); more handoffs between parties; more challenging quality control as well as exposure to currency fluctuations, labour disputes, shipping costs, corruption, theft and natural/geo-political instability. An understanding of this has led to many manufacturers adopting a hybrid strategy of remote production combined with near-sourcing.

The cost of transport (on which globalisation is predicated) is also overlooked as a major risk. This not only includes shipping rates which have been volatile over the past few years (in early 2012 shipping rates per teu rose by \$1000 overnight on Asia- Europe trade lane) but also cost of fuel which has been driven up by tension in the Middle East.

1.2 *Quantifying supply chain risk*

Manufacturers usually adopt one of three strategies when dealing with risk:

1. Inventory management – build up buffer stock
2. Sourcing – developing contingency strategies for specific suppliers or supply chain links
3. 'Acceptance' – doing nothing as costs of mitigation outweigh benefits

Deciding on which strategy to adopt relies on understanding the cost implications of each approach.

One pharmaceutical company undertook a cost/benefit approach to working out how it should mitigate supply chain risk. They used insurance and industry data to estimate the frequency and duration of disruptions, and using scenario planning software they worked out how many weeks a year their production would potentially be affected. They were then able to set inventory holdings at a level which would minimise disruption. Of course the weakness of this approach was that although it minimised disruption, the strategy imposed huge additional costs on the organisation, not only from the financing of the additional inventory, but also from the risks of redundancy of stock.

Modelling exercises also need to take into account the length of disruption as well as the probability. There are other variables: for example the length of time it takes for alternative suppliers to ramp up production. One other interesting factor which impacts significantly on the extent of disruption is the location of the event within the supply chain. The further upstream it occurs, the longer the disruption to supply. The reason for this is that down-stream processing locations act as bottlenecks and take time to fulfil back-orders once up-stream supply is switched back on.

In many respects, effective supply chain management is all about the trade off of one set of risks against another. Keeping higher amounts of stock in various locations is not necessarily a good response to the threat of disruption as this is not only costly, but in high tech sectors, for example, where product lifecycles are low, could be commercial suicide.

Lean supply chains are also a double edged sword. Whilst they are working efficiently they have the potential to reduce inventory levels at the same time as maintaining/improving customer service. However there is no doubt that they are less resilient to external shocks, as they do not provide a safety net when supply chains break down.

In effect, what has happened in the past is that inventory levels have been used as ‘insurance’ against risk. If there have been disruptions to supply or to transportation, ‘buffer’ stock has allowed production or sales to continue unaffected. Insurance companies which are now entering the supply chain risk market are allowing manufacturers to out-source this risk, whilst keeping inventory levels to a minimum. Quantifying the risk for insurance companies (as well as manufacturer) is a major challenge.

1.3 *Types of supply chain threat*

When people talk about supply chain risk, they usually mean ‘external’ threats. As we have discussed, though, the relation between external and internal risk is very close. For example, increasing inventory levels increases ‘internal’ risks (redundancy, wastage, financing etc) but mitigates external risks (the impact of a disruptive event on supply).

The reverse is also true; reducing ‘internal’ risks can increase ‘external’ risks. For example, the problems which Toyota faced in the US relating to a malfunctioning brake pedal design were blamed on a supplier. One estimate put the total costs of this supply chain catastrophe to Toyota at \$2bn, not including lost consumer confidence. With 60-70% of a vehicle manufacturer’s inventory managed by the supply chain, quality control is obviously a huge issue.

Global Supply Chain Risk – Supply Chain Internal & External Characteristics		
Supply Chain Characteristic	Internal Risk	External Risk
High Stock Levels	High	Low
Lean Supply Chains	Low	High
‘Bundled’ in-house production	High	Low
‘Unbundled’ out-sourced production	Low	High
Globalised sourcing	Low	High

Source: Transport Intelligence

This perhaps can be seen as the inevitable consequence of a trade-off between these different types of risk. However, one piece of research suggests that when out-sourcing production (and risk), only 10% of manufacturers undertake any sort of risk assessment.

Where external events have had most impact, this has been due to insufficient risk assessment. One such example was the floods in Thailand. Here the risk of centralisation (which can occur in any geography) was transplanted to a remote region where risk was

not fully understood. The high tech manufacturing cluster which developed in Thailand had comparative advantage in terms of leveraging a local production eco-system whilst offering low cost labour. The fact that this cluster developed in a region of South East Asia was not the problem; rather that a consolidation of specific competences had been allowed to develop in an exposed, flood-prone location.

External threats to supply chains can be divided into four main categories:

- Environmental
 - These include a wide range of events including extreme weather, earthquakes, tsunamis, floods and even volcanic eruptions. The economic cost of natural disasters was estimated by insurance company Swiss Re at \$194bn in 2010. The supply chain consequences are derived from not only the disruption of production but also the impact on transportation services and infrastructure. A WEF/Accenture study found that following the Japanese tsunami/earthquake the operating profits of 15 leading multinationals fell by 33% in the subsequent financial quarter directly as a result of supply chain disruption.
- Geopolitical
 - Tensions in the Middle East are a considerable source of risk for supply chains, especially affecting transit routes such as the Straits of Hormuz and the Suez Canal.
 - Terrorism also falls into this category, the most obvious example being the events of September 11. A more recent example, described below, relates to the bombs placed in packages originating from Yemen. It should be noted that as regulators seek to limit the impact of a terrorist event, they risk increasing supply chain costs by high levels of security-driven regulations and procedures. This would seem to counter-productive, but politically expedient.
 - Piracy is also a major issue for supply chains, although the true cost of the disruption is largely hidden. Although millions of dollars are paid to pirates off the Somali coast each year, the real costs occur when shipping lines have to divert to longer routes to avoid the problems areas. Other costs include increased insurance; security and guards; increased steaming speeds; higher wages for seamen (danger money) not to mention indirect payments for military operations.
- Economic
 - One of the most pressing supply chains risks from an economic perspective is what can be termed 'demand shocks'. An example of this is the disruption caused by the company failure of suppliers following the 2008 recession. This was

particularly relevant to the high tech and automotive sectors where supplier bankruptcy was prevalent. Many of the problems were caused by manufacturers 'switching off' supply from remote suppliers, and although this had a short term positive effect on inventories and balances, it meant that when demand picked up strongly in 2010, manufacturers were unable to meet demand.

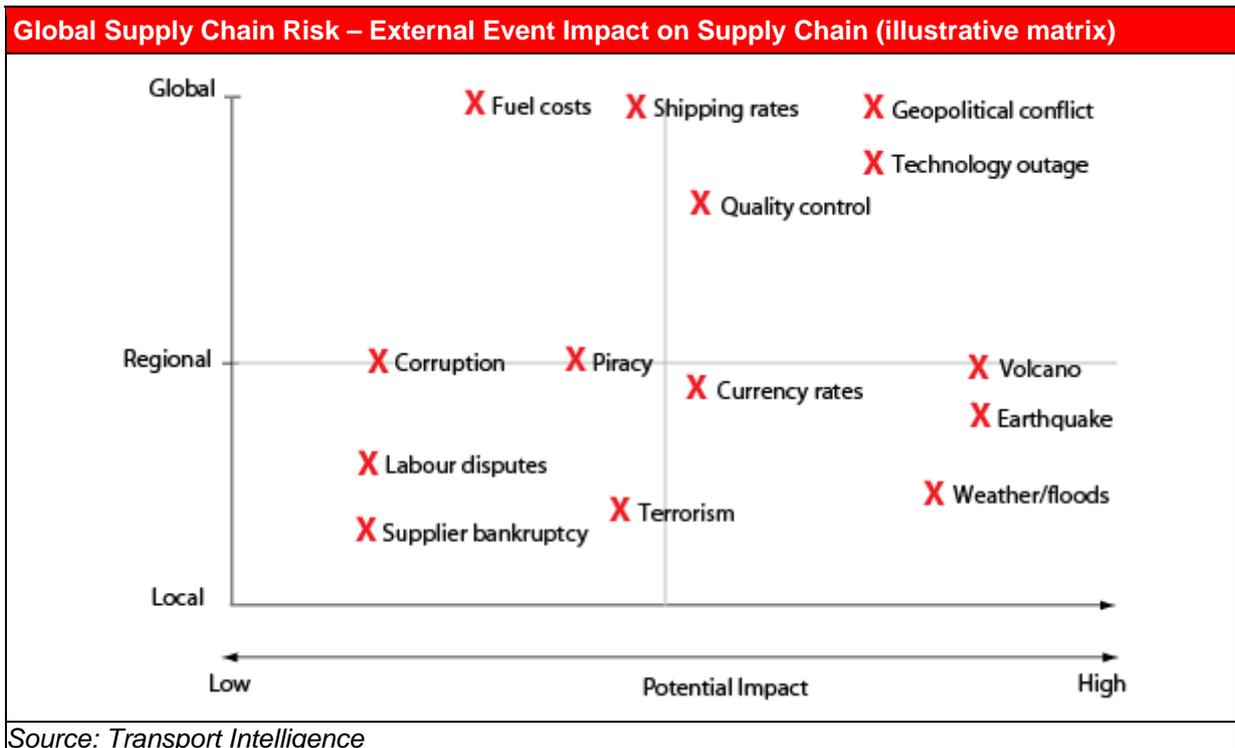
- 'Supply shocks' are less obvious, but a material threat all the same. The volatile nature of shipping rates could fall into this category. In early 2012 shipping rates on Asia – Europe routes increased by about \$1000 per teu (from about \$650 to \$1650) – a situation which most shippers would find difficult if not impossible to predict.
- Manufacturers are ever more exposed to currency risks given the globalised nature of their suppliers and customers. Given the Greek debt-crisis and the impact this is having on the strength of the euro against the dollar, this risk is likely to have significant financial impact in the coming months and years.
- Technological
 - Technology failure/outage is a major concern to shippers, although as yet there have been few significant incidents. A lot of money has been spent by agencies, such as the Pentagon, in assessing and planning for a 'cyber terrorist' attack, although minor disruption to date has come from power failures or accidents. More reliance in the future will be placed on information and communications networks as the supply chain industry becomes increasingly paperless and this will only heighten the risks. However actually measuring the true nature of the threat and robustness of information systems is difficult.

The chart below (p.11) provides a purely illustrative attempt to assess the damage which an external event can have on a supply chain. For example, an earthquake such as the one in Japan in 2011 has a very major impact on supply chains, but only at a local or regional level. A flood can have the same impact, but is only very serious if a large number of suppliers are clustered in the affected area.

Shipping rates, in contrast, are a global phenomenon. They affect all supply chains, but although serious, have less of a catastrophic impact.

A geo-political conflict, depending on where it takes place, could have a very serious, disruptive impact at a global level. A supplier bankruptcy, on the other hand, may be a local problem, and if contingency plans are in place, may not be serious.

Of course, the seriousness of each of these threats is very specific to each supply chain as well as the level of disruptiveness of the event in question.



1.4 **Unknown unknowns...**

The most disruptive supply chain events are those which have not or cannot be planned for. Therefore it is perhaps more useful, rather than look at past events in order to gain some insight into the future, to identify weaknesses in supply chains instead. Addressing vulnerability is the best way to mitigate the impact of a disruption, although there still remains the issue of how much time and money should be invested on each perceived weakness.

The World Economic Forum's Supply Chain and Transport Risk Survey 2011 identified the least effectively managed supply chain components as rated by respondents. The top five are:

- Reliance on oil
- Shared information
- Fragmentation along the value chain
- Extensive subcontracting
- Supplier visibility

As the survey analysis points out, three of these components relate to visibility and control. Improvements in technology can mitigate this type of risk. For example:

- Development of supplier/buyer communities and the use of social media technologies within supply chain communities could be one way in which risks can be reduced.
- 'Sense and respond' technologies allow for greater awareness of the location of products in the supply chain, and hence enabling better decision-making/re-routing.

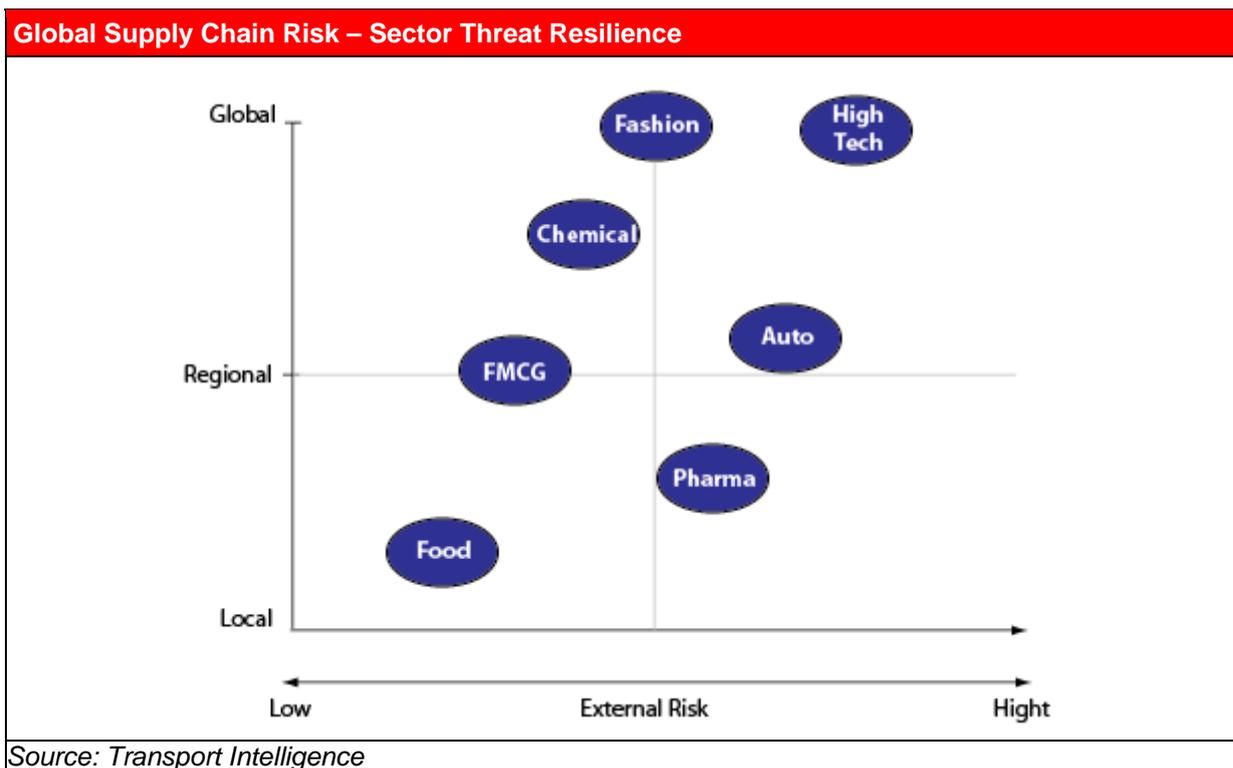
The development of information technologies will play an important role in the mitigation of supply chain threats. There is little prospect that these risks will diminish – some may even increase. Therefore the ability to react to events will become the key competitive differentiator, and technologies which enable an enhanced level of supply chain agility will become highly sought after.

However the adoption of more technology will also play a role in increasing risks. Increasing reliance on technology will leave supply chains open to 'cyber attacks' or even accidental outages. Whilst technology will lead to greater levels of efficiency, it will also mean that maintaining robust networks will be ever more critical.

Despite this it is the industry's reliance on oil which is of primary concern. Given the relation between geo-political tension and the price of oil and the extreme volatility which this causes, it is clear that alternative strategies must be developed. This could entail a re-balancing of the inventory/transportation equation as shippers position stock in closer proximity to end users. This will increase stock levels, but reduce transport costs. Of course, as mentioned above, this has risks in its own right and these need to be taken into account in a holistic supply chain management strategy. It could also entail a move from global supply chains to near-sourcing of products, especially utilising less fuel intensive modes of transport.

1.5 Sector resilience to threats

The characteristics of some supply chains make them more vulnerable to supply chain threats than others. The chart below illustrates this point. The high tech sector, for example, relies heavily on global supply chains which are typically high value, lean and unbundled/out-sourced. The pharma supply chain is much less globalised, and although there are intrinsic risks for the products themselves, the high level of in-house production/distribution mitigates many of these risks. With greater levels of out-sourcing in this sector, the external risks are set to rise. Food supply chains tend to be local, characterised by low product value and, in most cases, have low levels of risks attached.



1.6 *Examples of Supply Chain disruption*

1.6.1 **Natural Disasters**

1.6.1.1 **Japanese tsunami**

The impact of Japan's recent earthquake and tsunami on global supply chains was dramatic with production across a whole range of sectors badly affected.

The Japanese electronics sector was amongst the hardest hit. Output of NAND flash memory, on which new consumer electronic equipment depends, was disrupted, albeit on a temporary basis. Many wafer fabrication plants, supplying the semi-conductor industry, remained closed whilst aftershocks continued to take place.

More surprising was the effects on other industries. The Japanese automotive sector traditionally has a highly localised supply chain with mechanical component manufacturers located next to major assembly plants. Although these supplier parks weren't affected, production was halted all the same.

One reason why these automotive plants were hit is the increasing number of electronic components in new motor vehicles. Already a huge part of the value of new cars, electronic component sourcing differs to that of mechanical parts. Increasingly the more complex assemblies are sourced globally, with physically small yet important and expensive products often moved by airfreight from distant production locations. This illustrates an emerging trend in the automotive supply chain.

Plants beyond Japan suffered as well. For example Toyota's plant in the UK shut down production due to uncertainties over component supply. Renault's Samsung plant in South Korea also slowed output due to problems accessing its supply chain, part of which it shares with Nissan.

In fact supply chains in the electronics sector, heavily dependent on Japanese production, were affected right across Asia. There were reports of key electronic components being in short supply as leading electronic manufacturers such as Sony, Sharp and Panasonic shut plants.

Japan has a large chemical sector much of which is located on the coast. Many of these facilities were damaged, with Dow Chemical already reporting one of its facilities flooded.

However things could have been worse. More widespread disruption was prevented by global supplies of flash memory on hand having built up over the previous two months.

Manufacturers were also able to shift production from Japan to facilities outside the country.

It is believed as a result of the tsunami that manufacturers increased orders to buffer against future supply chain disruptions. Higher inventory could become the 'new normal' in the future, a calculated measure deployed to mitigate the disrupting effects of natural disasters.

1.6.1.2 The Thailand Floods

In 2011 Thailand suffered one of the worst floods in five decades. The floods began in July, but steadily worsened throughout October, and are mainly limited to northern and eastern areas around Bangkok. However, these affected areas were home to hundreds of manufacturing facilities that were completely flooded. The automotive and hard disk drive manufacturing industries were among the hardest affected.

Japanese car makers that had just started to recover from the earthquake and tsunami now faced shortages of key parts made in Thailand. Toyota and Honda both had to halt production at facilities even in North America because their Thai suppliers were flooded.

The hard disk drive manufacturing sector was particularly affected. Thailand is the second largest country for production of hard disk drives after China. Toshiba, the fourth largest producer of hard disk drives halted all of its production in Thailand, however, Seagate, the second largest producer of hard disk drives, did not have to stop production because its factories were in the northeast where flooding was less severe. Shortages of supplies lasted into the first quarter of 2012. Prices increased 20%-40%.

Subsequently semiconductor chip manufacturer Intel warned that its revenues and profits would be lower than expected due to shortages of hard disk drives in the industry. Due to the closures, Intel's customers were not able to source sufficient volumes of hard disk drives to meet demand, and cut down on their microprocessor inventories. Intel warned that the shortages would continue into the first quarter of 2012.

Intel was not the only manufacturer struggling. Dell also missed sales targets in its quarterly results due, in part, to shortages of hard disk drives. However, management said that it had made strategic purchases of inventory elsewhere in an attempt to overcome this problem. This inevitably came at a cost.

Thailand supplies about 40% of the world's market of hard disk drives. The supply chain problems which high tech manufacturers are facing re-opened the debate over the wisdom of sourcing from suppliers clustered in such a vulnerable area.

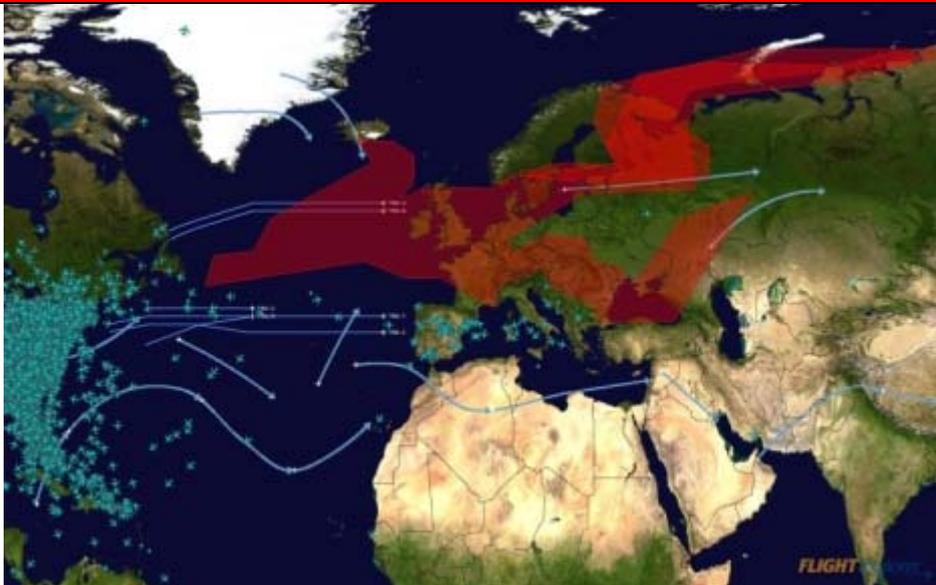
1.6.1.3 Icelandic volcanos

The eruption on 14 April 2010 of Iceland's Eyjafjallajokull volcano (the second eruption in a month) caused havoc throughout Europe and beyond. The impact of this first eruption in 190 years continued even after airspace restrictions were lifted.

The regulators' decision to shut down airspace in Britain, Norway, the Netherlands, Germany, Austria, Belgium, Denmark, Finland, France, Germany, Latvia, Luxembourg, Poland, Slovakia, the Czech Republic, Bulgaria, Sweden and Switzerland cost airlines some \$200 million per day from cancelled flights and caused the European economy to suffer massive losses in lost business.

The obvious reaction by logistics planners was to use other modes of transport for intra-European movements. The main problem was handling inter-continental traffic. As a contingency, freight forwarders and airlines set up hub activities in airports in southern Europe. For example UPS flew some freight to Istanbul and moved it into Europe by road. Other providers used North African or even Middle Eastern airports.

The scope of disruption from the eruption of Eyjafjallajokull volcano



Source: Transport Intelligence

The supply chain consequences were felt further afield than in Europe, and no more acutely than in east African markets. Here perishable air cargo, such as fresh fruit and flowers, backed up at airports and, given the lack of appropriate temperature controlled storage facilities, much of it was ruined. This caused considerable hardship to exporters and their employees.

1.6.2 Conflict and Political Unrest

1.6.2.1 The Straits of Hormuz

Tensions between Iran and the West increased in 2011 with sanctions imposed as a result of Iran's nuclear programme starting to bite. In response to the US and EU's further plans to block exports of Iranian oil exports, Iran retaliated by threatening to close the Straits of Hormuz. This is the narrow passage between Iran and Oman linking the Gulf with the Indian Ocean. 20% of the world's oil supplies pass through the Straits as well as container vessels using the UAE's and other Gulf countries' ports.

Many analysts believe that Iran's threats were baseless, and that closing the Straits would be economically and politically damaging, not only to relations with the West, but with its powerful neighbours Saudi Arabia and UAE. However, military activity in the area, a test of a new missile and warnings to the US Navy that its carriers should stay out of the Gulf, ratcheted up tension.

The consequences of any sort of military action in the Straits of Hormuz would be severe. Dubai is the ninth largest port in the world and the region has in recent years developed as a major hub for shipping, supplying Indian, Central Asian and African destinations with Asian-originating products. International sea-air business would also be affected, not to mention end markets in the Gulf itself.

Of more immediate concern to supply chains is the impact of the war of words on global oil markets. The possibility of the closure of the Straits, which acts as a transit for 17m barrels of oil a day, was a factor in the rising oil price, despite the weak economic environment.

1.6.3 Economic/Demand shocks

1.6.3.1 Cisco's troubles typify supply chain challenges

In June 2010, the Council of Supply Chain Management Professionals (CSCMP) asserted that the sharp destocking experienced during the recession had disrupted supply chains and that many organisations had to resort to emergency measures to cope when demand picked up. This, according to the Council, was behind much of the boom in airfreight seen in the previous few quarters as manufacturers desperately sought to source components and support increased production. What emerged were some examples of such supply chain stress.

Take Cisco, a huge company built on the design of the hardware that makes up the infrastructure of the internet. For much of 2010 Cisco was in crisis due to the malfunctioning of its supply chain. Its customers complained that the company could not deliver its products on time or, in some cases, even deliver them at all. Engineers maintaining infrastructure such as data centres were facing a wait of up to 12 weeks for basic switching components.

The origin of the problem clearly lay with Cisco's suppliers, many of them based in China. According to a statement from Cisco itself, the issues were, "Attributable in part to increasing demand driven by the improvement in our overall markets....the longer than normal lead time extensions also stemmed from supplier constraints based upon their labour and other actions taken during the global economic downturn". In other words, component suppliers laid off workers during the recession and reduced capacity. Consequently there was not enough production capacity to fulfil demand.

It was also very interesting to see the reaction of customers to the worsening supply situation. According to Cisco, this led customers, "...to place the same order multiple times within our various sales channels and to cancel the duplicative orders upon receipt of the product, or to place orders with other vendors with shorter manufacturing lead times."

In its statement Cisco said that, "Our efforts to improve manufacturing lead-time performance may result in corresponding reductions in order backlog. A decline in backlog levels could result in more variability and less predictability in our quarter-to-quarter net sales and operating results". This might be taken as typical 'squirreling' behaviour where customers increase inventory levels in an environment of uncertainty. The result is lumpy demand, with wild swings between shortage and over-stocking.

The economic stress being visited upon supply chains led in turn to a failure to manage inventory properly. This in turn affected the management of transport. Or in the words of Cisco, "We have experienced periods of time during which shipments have exceeded net bookings or manufacturing issues have delayed shipments, leading to nonlinearity in shipping patterns. In addition to making it difficult to predict revenue for a particular period, nonlinearity in shipping can increase costs, because irregular shipment patterns result in periods of underutilized capacity and periods in which overtime expenses may be incurred, as well as in potential additional inventory management-related costs."

In other words, this statement meant Cisco, an erstwhile poster child of supply chain excellence, faced immense challenges in its logistics.

1.6.4 Terrorism and piracy

1.6.4.1 Yemen-originated terrorism

The placing of a parcel bomb on a Qatar Airways plane between Sana'a, Yemen and Dubai as belly-hold-freight amplified the issue of security for the air freight sector. Whilst it was disturbing that terrorists were able to penetrate the networks of FedEx and UPS, the Qatar Airways incident demonstrated that the whole of the airfreight industry is affected by the problem.

Although freight industry organisations cautioned against an excessive security clamp-down, politicians in Britain and the United States committed to security reviews. This reaction by the authorities is likely to take the form of more inspection and scanning, possibly leading to the wider use of 'explosive detection systems'. These are complex pieces of engineering which are both slow and very expensive but they do offer better performance against nitrate based explosive than x-ray systems.

In the latest cases the core problem is that the primary systems put in place to prevent the loading of explosive devices failed. Both the surveillance technology being used at present and the 'Known Consignor' system were either deceived or by-passed. It is worth observing that it was the Express providers who were targeted as these systems are possibly more open to the general public and therefore may offer greater opportunity to hide the identity of the person placing the package in the system.

The lesson that the incidents appear to give is that the nature of the threat is dynamic rather than static. The individuals placing the bombs into the freight systems designed the devices to deliberately evade the security systems. This displayed both a knowledge of the security systems used and the ability to design a device capable of evading these systems. Therefore any effective new security systems put in place by the air cargo sector is going to have to be both pro-active and continually adaptive.

In truth there is nothing particularly original about the approach taken in the most recent devices. The bomb on Pam Am 103 which blew up over Scotland 22 years ago had strong similarities in design. However the innovation of disguising explosive as printer-toner illustrates an evolution in the nature of the problem. The air freight business systems must in turn evolve to anticipate such developments. It must achieve this whilst not crippling the operations of the business either in terms of time to scan each consignment or cost. Either way the cost penalty of developing such a response quickly and across the whole air cargo system is likely to be substantial.

The question is whether to approach the security with a risk-based strategy that relies on characteristics of a shipment to identify packages for increased scrutiny or one in which all shipments are subject to some form of physical inspection.

Proponents of comprehensive physical screening argue that it is the only way to ensure adequate security, while advocates of risk-based approaches argue that comprehensive screening is too costly and too time consuming. Costs of implementing 100% screening is estimated to be over \$3.5bn over a 6 year period. Not only is this an expensive approach but probably an inefficient one as shipping delays are likely to occur with this method.

Under the current air cargo security system, a number of risk-based strategies are being implemented and expanded to evaluate the security risk of air cargo shipments. Existing programs such as the Known Shipper Program and the Certified Cargo Screening Program, both of which have been in place for several years, are being studied for potential enhancements and expansions.

Another measure that must be taken on is technology. The TSA has approved a number of x-ray, bulk explosives detection systems and explosives trace detection machines for screening air cargo. However, these are variations of technologies used for screening checked baggage and carry on items. Unfortunately none of these devices are capable of effectively screening palletized or containerized cargo which makes up 75% of all cargo carried on passenger planes. Instead, screening must be done on individual cargo items.

As a result, the TSA is studying various new technologies. In FY2010, TSA carried out a pilot program at 18 locations to evaluate the effectiveness of selected screening technologies. The study concluded in August 2010. TSA is now assessing the performance of the various screening technologies and methods employed.

The US Department of Homeland Security and the TSA will need to also monitor and provide a solution for international air cargo entering the US. Most of the focus has been on air cargo screening of out-bound domestic US cargo. Although the TSA lacks the direct authority to dictate screening requirements at foreign airports for US-bound cargo, it could potentially impose regulations on foreign carriers, as well as US carriers. However, enforcement overseas would be up to authorities in other countries. If they do not concur with the US approach, disagreement over security standards could complicate US foreign relations and could potentially impact foreign trade.

1.6.4.2 Somali Piracy

It has been estimated that pirates cost the world economy an estimated \$6.9bn (£4.3bn) last year. In 2011, the pirates reportedly raised \$159.6m from 31 paid ransoms.

Piracy off the coast of the Horn of Africa has been continuing for several years with not a great deal of sustained attention. However, the problem is a significant hazard to transport on one of the core global transport routes. Certainly at the beginning of 2011 it appeared to be escalating, although since then action by various navies has suppressed activity, with a recent report by the International Maritime Bureau suggesting a fall in the number of attacks.

Despite some successes for the campaign, attacks by pirates are on-going. In May 2012, the Greek-owned oil tanker MT Smyrni, carrying 135,000 tonnes of crude oil, was hijacked in the Arabian Sea; the first successful attack on an oil tanker for more than a year.

One of the problems has been that captured pirates have been difficult to imprison or get to trial due to the lack of countries willing to take them. This has led many to be repatriated after a brief spell on a European warship.

In response to the problems, a private navy costing \$70m is being set up to escort merchant ships through the Gulf of Aden. It will comprise 18 ships, based in Djibouti, and will offer to convoy merchant vessels along the Internationally Recognised Transit Corridor (IRTC).

The initiative has been established by Convoy Escort Programme (CEP), a British company launched by the shipping insurers Jardine Lloyd Thompson (JLT) and the Lloyds of London underwriters Ascot.

In addition, the British Government's endorsement of the use of armed guards on merchant vessels is another step towards the routine arming of ships passing through the Red Sea and Indian Ocean. The minister responsible for a policy which is effectively regulating the arming of cargo ships commented that "by allowing the use of armed guards in a structured, legal framework we can move to a system where ship owners can provide an adequate deterrent against this scourge on the maritime industry".

1.7 **Conclusion**

Although global supply chains have created mutual benefits for developed and emerging markets alike, these same supply chains have increased risk to the global economy. Reliance on production in markets such as China and the rest of Asia Pacific has put Western economies at the mercy of a series of internal and external threats to its extended supply chains.

Production in remote locations has brought with it increased exposure to environmental threats such as the tsunami in Japan and the floods in Thailand, both of which have been important in raising the issue of supply chain vulnerability. These events brought massive disruption to automotive and high tech supply chains, but both could have been much worse. The first step for many manufacturers will be to accept that global supply chains bring with them risk. However once the threats have been identified, quantifying them will be harder still.

1.8 ***Bibliography***

New Models for Addressing Supply Chain and Transport Risk, World Economic Forum, 2012

Supply Chain Risk: Its Time to Measure It, J.Paul Dittman, Reuben Slone and John T.Mentzer in Harvard Business Review February 2010

Quantifying supply chain disruption risk using Monte Carlo and discrete-event simulation, A.J.Schmitt and M.Singh, Proceedings of the Winter Simulation Conference 2009, IEE

Relocating the Value Chain: Off-shoring and agglomeration in the global economy, Richard Baldwin and Anthony J. Venables, Oxford University, March 2011

Tackling the Rising Supply Chain Risk Threat, Beth Enslow, Marsh & McLennan

Contact Transport Intelligence

If you have any feedback on this report please do not hesitate to get in touch with us by any of the following means:

Telephone: +44 (0)1666 519900

Email: mnordmann@transportintelligence.com

Web: www.transportintelligence.com

Or by post:

Transport Intelligence Ltd

1 -3 Callow Park

Brinkworth

Wiltshire

SN15 5DF

United Kingdom