

Supply chains are becoming far more vulnerable to external disruptions. As companies source from further a field, so too, the risks multiply. But, much can be done to prepare for the worst.

By Professor Martin Christopher and Dr Helen Peck



Today's commercial enterprise is subject to challenges and pressures on an unprecedented scale. Many issues have the potential to severely affect the continuity of the business, in particular through disruption to the wider supply chain. Indeed, it can be argued that supply chain risk is currently greater now than ever.

A key source of risk is the increasingly turbulent business environment. Not only is demand more volatile but, as supply chains inevitably become more global, so too does their vulnerability increase.

The 'global village', enticing though it sounds, brings with it many potential threats

as recent events have demonstrated.

A further reason for this increased risk has come, paradoxically, from the focus on efficiency and cost reduction which, for understandable reasons, have been the predominant managerial tendency of recent years. Examples of such strategies would include the move to off-shore sourcing and manufacturing in pursuit of lower labour costs; the widespread adoption of 'lean' practices particularly through inventory and capacity reduction; and the continuing trend to outsourcing and single sourcing.

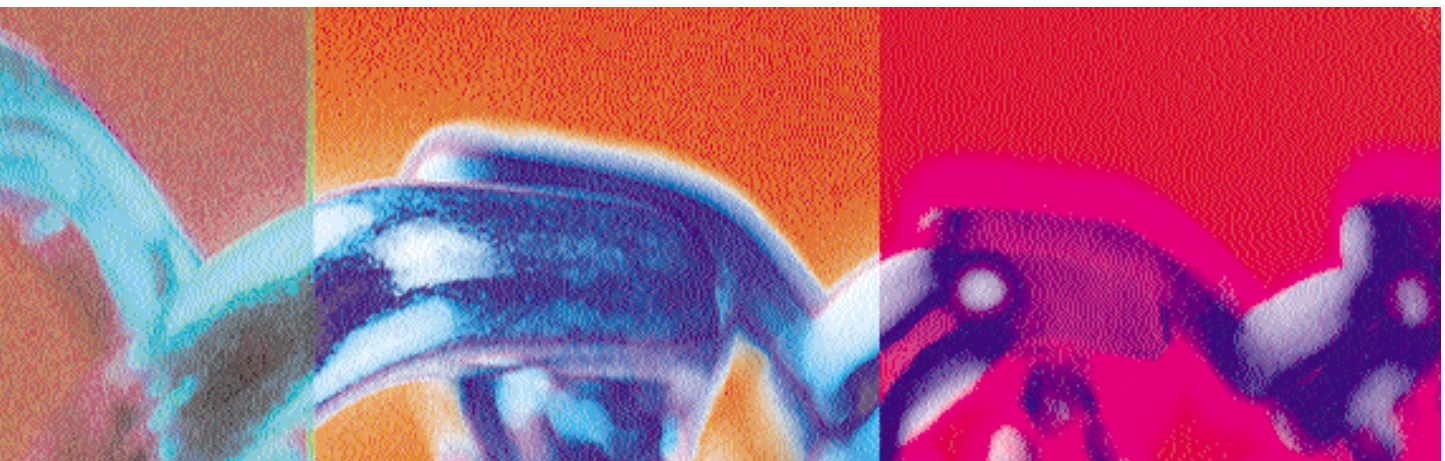
All of these strategies can lead to beneficial outcomes for the business but equally all

of them can radically change the risk profile of the supply chain.

Recent research at the Cranfield Centre for Logistics and Supply Chain Management supported by the UK Department for Transport, has highlighted the extent of the risk that is now embedded in the typical supply chain. It is apparent that our supply chains today are far more complex, and their interdependencies greater, than ever before.

The interdependencies between organisations and their supply chains were well illustrated by the predicament of Ford subsidiary Land Rover in January 2002, when the car maker's production was endangered by the

# The five principles of supply chain resilience



collapse of its supplier UPF-Thompson. The supply chain was actually at risk because of the failure of UPF's business, due to losses suffered by UPF in an unrelated but ill-starred foreign venture, not as a result of a problem between the supplier and its automotive industry customers.

## Risk management

The range of risks facing contemporary supply chains can appear daunting, but they can be mitigated through a systematic approach to supply chain risk management. A number of basic principles underpin the creation of a more resilient supply chain.


Elements of each are shown in the chart over the page.

**Supply chain (re)engineering** – A fundamental pre-requisite for improved supply chain resilience is an understanding of the structure of the network that connects the business to its suppliers and their suppliers and to its downstream customers and their customers. When designing a supply chain from scratch it is possible to weigh up the benefits of applying techniques, such as real options thinking, to assess the benefits and costs of designing an amount of 'just-in-case' redundancy into the supply chain structure. For existing supply chains, map-

ping tools can help in the identification of 'pinch points' and 'critical paths'. Pinch points will often be characterised as bottlenecks where there is a limit of capacity and where alternative options may not be available, such as, ports capable of taking large container vessels or centralised manufacturing and distribution facilities which, if they were to become inoperable, would place an intolerable strain on the rest of the system. Identified weaknesses should be recorded in a regularly updated risk register.

**Supply base strategy** – The reduction of the supplier base in many companies often facilitates focused supplier development pro-

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agement of risk has to be network-wide too. A high level of collaborative working across supply chains can help mitigate risk. The challenge is to create the conditions in which collaborative working becomes possible. Traditionally, supply chains have been characterised by arms-length even adversarial relationships between the different players. There often has not been a history of sharing information either with suppliers or customers. More recently however, there have been encouraging signs that a greater willingness to work in a spirit of partnership is emerging in many supply chains. For example, in the fast moving consumer goods (fmcg) industries there is now significant collaboration between manufacturers and retailers in the form of Collaborative Planning Forecasting and Replenishment (CPFR) initiatives.

**Agility** – One of the most powerful ways of achieving resilience in the supply chain is to create networks that are capable of more rapid response to changed conditions. This is the idea of agility, whereby the time required to respond to new circumstances is dramatically reduced. Time compression is

at the heart of agile strategies and those organisations that have put an emphasis on seeking out opportunities for eliminating non-value activities in their supply chains are usually better placed to respond to unexpected events.

Agility is founded upon two key principles: velocity and visibility. Velocity, and indeed acceleration, requires shorter end-to-end pipelines which themselves are dependent upon sourcing decisions as well as internal process improvement. Visibility impacts agility in a number of ways. Firstly it reduces uncertainty and enables the goal of a demand-driven supply chain to be achieved, and secondly it reduces supply chain risk through shared information, both upstream and downstream, of the firm's operations.

**Creating a supply chain risk management culture** – In the same way that many organisations recognised that the only way to make Total Quality Management (TQM) a reality was to engender a culture that made quality the concern of everyone, so too, today there is a requirement to recognise that risk management should extend beyond the current boundaries of business continuity manage-

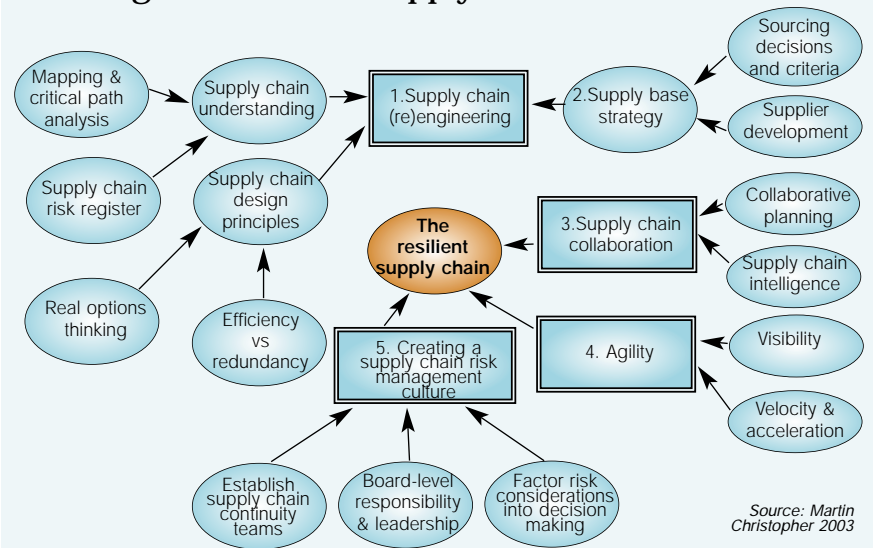
grammes. However there may be limits to which the rationalisation process should be pursued. Single sourcing (where one supplier is responsible for the supply of a specific item or service), may be advantageous from a cost and quality management perspective, but could be dangerous in terms of resilience. It may be desirable to have a lead supplier, but wherever possible alternative sources should be available.

### Reducing downside risk

Where a firm has multiple sites it may be possible to have a single source for an item or service into each site thus gaining some of the advantages of single sourcing while reducing the downside risk. Similarly, if a manufacturing firm makes a range of products, it may be possible to single source by product thus keeping an alternative source of supply available.

**Supply chain collaboration** – It will be apparent that since supply chain vulnerability is by definition a network-wide concept, the man-

## Creating the resilient supply chain



Source: Martin Christopher 2003

ment to become 'supply chain continuity management'.

As in every case of culture change within organisations, nothing is possible without leadership. Not every company has supply chain management represented in its own right in the Boardroom, however it can still be argued that supply chain risk assessment should be a formal part of the decision making process at every level. Thus when changes in business strategies are contem-

plated, such as a move to off-shore sourcing, then the resulting supply chain risk profile should be assessed. A cross disciplinary supply chain risk management team should be assembled within the business and charged with regularly updating the supply chain risk register. Their findings should be relayed to the main Board via the appropriate director on at least a quarterly basis.

Together, the five principles set out above should take organisations a long way

towards avoiding supply chain disasters, such as the one that befell one-time mobile phone set manufacturer Ericsson in 2000, an event that its more resilient rival Nokia survived with no lasting ill effects.

### Greater interest

Our research suggests that businesses are becoming more aware of supply chain risk and more interested in improving resilience. Their primary focus remains on the reduc-

## Case study: Nokia and Ericsson



### A close call

In March 2000 worldwide demand for mobile telephones was booming. Two of the international market leaders were Finnish electronics company Nokia and its Swedish rival Ericsson. This is the tale of how an 'Act of God' half a world away would set off a train of events that would eventually displace one from the market forever.

The story begins on the evening of March 17th 2000, with a thunderstorm over Albuquerque, in central New Mexico. A lightning bolt hit a power line, which caused a fluctuation in the power supply, resulting in a fire in a furnace in a nearby semiconductor plant owned by Dutch firm Phillips Electronics NV. The fire was brought under control in minutes, but eight trays containing enough silicon wafers for thousands of mobile phones were destroyed. The damage to the factory from smoke and water was much more extensive than the fire itself, contaminating its entire stock of millions of chips. The suppliers immediately prioritised customers, according to the value of their business. Between them, Nokia and Ericsson accounted for 40 per cent of the plant's output of the vital radio frequency chips, so these companies were put at the top of the supplier's list.

On 20th March, over in Finland, Nokia's event management systems indicated that something was amiss. Orders were not coming through as expected, so a components purchasing manager telephoned the supplier who informed him that there had been a fire in the plant which was likely to disrupt production for around a week. Nokia was not unduly alarmed, but dispatched engineers to New Mexico to investigate the situation. Phillips was refusing to allow visitors to inspect the damaged facility.

Having been unable to investigate the problem further Nokia staff increased monitoring of in-coming supplies from weekly to daily checks.

It became clear soon afterwards that the problem was so serious that supplies would be disrupted for months. Pressure was brought to bear at the highest levels between Nokia and its supplier to ensure that all other Phillips plants were commissioned to use any additional capacity to meet Nokia's requirement.

In addition, Nokia immediately sent representatives out to its other suppliers in the US and Japan to secure priority status for all available supplies of chips, and persuading them to ramp up production as quickly as possible. Because Nokia was such an important customer, the suppliers obliged with a lead-time of less than one week. Nokia also set about reconfiguring its products to take slightly different chips from other sources.

Ericsson had also found out about the fire soon after it occurred, but having been assured by the suppliers that the fire was unlikely to cause a major problem, had not acted further until early April. By then Nokia had already moved to secure its supplies, and unlike the quick acting Finns, Ericsson had no alternative sources of supply. It had taken the decision some years earlier to single source key components in a bid to simplify its supply chains as a cost reduction measure.

Ericsson lost an estimated €400m in new product sales as a result of the fire. An insurance claim would later offset some of the direct losses, nevertheless Ericsson was forced to cease manufacturing mobile phones. In contrast, Nokia claimed it was able to maintain production levels throughout, enabling it to cement its position as global market leader.

## The increasing vulnerability of supply chains requires a new focus on managing and mitigating risk which extends beyond the four walls of the single firm. It requires a much greater level of awareness of where the risks lie



tion of day-to-day commercial risk from sub-optimal performance. Nevertheless, there is a tacit acknowledgement that supply chains are becoming more vulnerable to exceptional events. The likelihood of an event occurring may or may not have increased, but contemporary supply chain trends have magnified their potential impact on the organisation concerned and, very likely, those immediately adjacent to them.

The increasing vulnerability of supply chains, therefore, requires a new focus on managing and mitigating risk which extends beyond the four walls of the single firm. It requires a much greater level of awareness of where the risk might lie and a much greater willingness to share information across corporate boundaries. These are

challenging times but our research has demonstrated that there are ways in which companies can create more resilient supply chains. Whilst it will not be an easy task, it is essential if business continuity is to be assured. ■

*A copy of the report 'Creating Resilient Supply Chains: A Practical Guide' and 'Understanding Supply Chain Risk: A Self-assessment Workbook' can be downloaded at [www.cranfield.ac.uk/som/scr](http://www.cranfield.ac.uk/som/scr)*

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### Case study: Land Rover and UPF Thompson



#### Rough ride

When chassis manufacturer UPF-Thompson became insolvent at the end of 2001, the impact upon its major customer, Land Rover, was sudden and severe. UPF Thompson was the sole supplier of chassis for the Land Rover Discovery, and receivers KPMG threatened to halt supply unless Land Rover made an immediate up-front payment of between €50 and €70m. KPMG justified its actions by pointing out that it was legally obliged to recover money on behalf of creditors and the sole supplier agreement represented a valuable asset. A court ruling had determined that receivers were legally entitled to exploit a customer's vulnerability for the benefit of creditors. Land Rover faced the possibility of having to suspend production of the Discovery, until a temporary injunction was secured granting the carmaker a short-term reprieve. The injunction averted the lay-off of 1400 workers at its Solihull plant, and many more amongst Land Rover's network of suppliers.