



Supply Chain Vulnerability

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Welcome to a
guide on
Supply Chain
Vulnerability



Recent growth in globalisation has created more complex supply chains and with that greater risks. Examining the vulnerability of an organisation's supply chain network can be used to identify such risks and weaknesses and produce mitigation strategies and corrective action plans as part of managing risk in procurement.

1. INTRODUCTION

For the purposes of this paper Supply Chain Vulnerability (SCV) is a point of weakness and/or possible threat to the supply chain network. These complex networks may increase the number of potential weaknesses in surety of supply, as may the use of other modern business practices.

The following is an example of when vulnerability changes from a 'point of weakness' to a serious risk.

A car with bald tyres is travelling along a motorway at 90 miles an hour. The bald tyres are a point of weakness that may only be highlighted when it starts raining and the car has to apply its brakes to avoid a traffic jam ahead. The risk would of course be that the car wouldn't stop in time as the bald tyres on the wet surface would have no grip on the road surface and as a result it goes into the back of the car in front, potentially causing a pile up.

Recent growth in globalisation has created more complex supply chains and with that greater risks. Examining the vulnerability of an organisation's supply chain network can be used to identify such risks and weaknesses and produce mitigation strategies and corrective action plans as part of managing risk in procurement.

Every employee concerned with supply chain management will be involved in managing threats and risks arising from weaknesses in their SCN's. Professionals at all levels needs to be aware that they should continually identify and manage risks in their area of responsibility, eg at director level, threats are more likely to be strategic and affect the entire business, whereas at buyer level, the risk of supply disruption is likely to be more tactical but still important.



2. THE CIPS POSITION

CIPS practice guides are designed to provide awareness and a level of understanding to the reader on selected topics, in this case on Supply Chain Vulnerability. They are written for use by those with an interest in business issues in general, and purchasing and supply management (P&SM) issues in particular. This will include full and part time P&SM professionals as well as individuals interacting with P&SM activities.

The guide will also include information on the contextual background to the issues, and will give a balanced opinion on issues that the reader may wish to consider. There will also be references to other sources of information.

Most Knowledge Works documents will contain CIPS position statements, that is, CIPS' view(s) on the document's subject matter. The CIPS views are arrived at via an extensive consultation with P&SM practitioners and people with expertise relevant to the subject, including working knowledge groups and the CIPS Policy Advisory Network (PAN). Following the consultation process the CIPS Council's Key Practice Statements Group finalise the statements.

CIPS is putting forward its views on supply chain vulnerability as the increasing risks inherent in complex SCNs have an impact on SCM professionals who need to be aware that they should actively identify weaknesses and risks and take appropriate action.

The complexity of modern SCNs has led to traditional purchasing and supply approaches to be challenged. The purchasing and supply function is developing new skills to meet the significant new challenges and CIPS believes its role, in accordance with its overall mission, is to:

- support its members, and other purchasing and supply management professionals, in fully taking advantage of the opportunities that may arise as the risks in the supply chain are minimised
- lead the purchasing and supply management profession in developing an understanding of Supply Chain Vulnerability in order to meet future challenges.

CIPS suggests:

- The SC must be managed totally, both upstream and downstream, in order to reduce SCV
- that SCV is actively managed
- that purchasing sees this as a core competence and that practitioners should enhance their skills to manage SCV issues effectively
- SCV cannot be managed in isolation, it must be managed in a co-ordinated effort across internal and external relationships
- maximum transparency of the SCN is to be encouraged
- SC planning is key



- SC strategy has to support business goals and therefore respond to customer requirements.

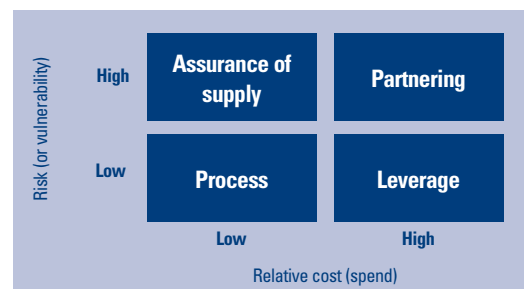
CIPS encourages P&SM professionals to be aware of the changing external business environment that impacts on the supply/demand balance. In certain industry sectors, for example, oil and gas, the supply/demand balance can change quite quickly to reflect external factors such as high or low oil price. When oil prices are high, activity levels are high and one can experience rapidly rising prices and/or scarcity of people and equipment. Conversely when oil price drops activity levels drop and better deals and/or availability can result. Professional procurement/SCM should be aware of these changes and adapt their market sector strategies to suit.

Procurement/SCM professionals are encouraged to develop market sector strategies that enable their corporations to take advantage of developing technologies whilst retaining sufficient flexibility where possible to switch when appropriate, although once implemented it is often very difficult to switch between technologies.

New relationships should be entered into allowing sufficient time to identify cost and performance norms in order to avoid vulnerability to cost increases and/or average to poor performance.

CIPS suggests that, wherever possible, the purchasing organisation should adopt a partnering approach to the important and vulnerable supplier relationships as a way of mitigating the risks of SCV. Whenever an organisation is significantly vulnerable to the consequences of failure of supply, the appropriate style of relationship to manage a supplier would usually be partnership.

However, too much concentration on partnering can introduce SCV on occasion. Partnerships and alliances can have a real competitive advantage at the outset of a



Courtesy of PMMS Consultancy Group

relationship but as time progresses complacency frequently creeps in and performance levels fall off. Often issues of supply performance are not addressed and mistakes are not learned from, as they are seen to be somehow in conflict with the spirit of the



partnering relationship. This complacency and “cosiness” in the supplier/buyer relationship is the very antithesis of how best to make a partnership work. Partnership is an environment where the parties need to be more frank, critical, open and willing to learn from mistakes than normal because the consequences of getting it wrong are so much greater.

Market place consolidation occurs in certain market sectors which can change the supply and demand balance, reduce competition and pass power to the suppliers.

CIPS suggests that the SCV implications of sourcing strategies and implementation are assessed and monitored to take account of external market and/or supplier changes.

3. CONTEXT

Situation

Why is this an issue?

Modern supply chains are complex networks that link organisations, industries and economies. Virtually all supply chains operate within a network (except maybe in the case of commodity provider to consumer) of multiple businesses and relationships - the SC is not simply a chain of businesses with one-to-one relationships. For the purposes of this paper we will use the term Supply Chain Network (SCN) to reflect this increased complexity.

Supply Chain Networks can comprise hundreds if not thousands of companies which may stretch globally and which can be subject to numerous risks. These risks can be largely classified into two types:

- 1) Weaknesses and potential risks within the SCN that impact on the ability to meet customer needs.

Instability arises when demand and supply are not in balance. Not only can price be affected, but also the total cost, time and performance.

- 2) Fragility of the SCN's to external events/threats both now and in the future.

Within a network rather than a chain, activities (i.e. travel between events) are just as important as the events themselves. To clarify, it is not just the activity steps that contribute to SCV, but also the movement or transfer (of product or information) which has SCV risk associated with it - ie goods moving physically, or important data becoming corrupted or held up. An example of important data being held up is that of the emergency services' reliance on the public mobile phone network to communicate with key workers during the 11/7 London terrorist bombing atrocity. Immediately after the attack, the network was overloaded and key workers could not be contacted. This highlights an inherent SCV resulting from an information transmission failure in the supply chain for

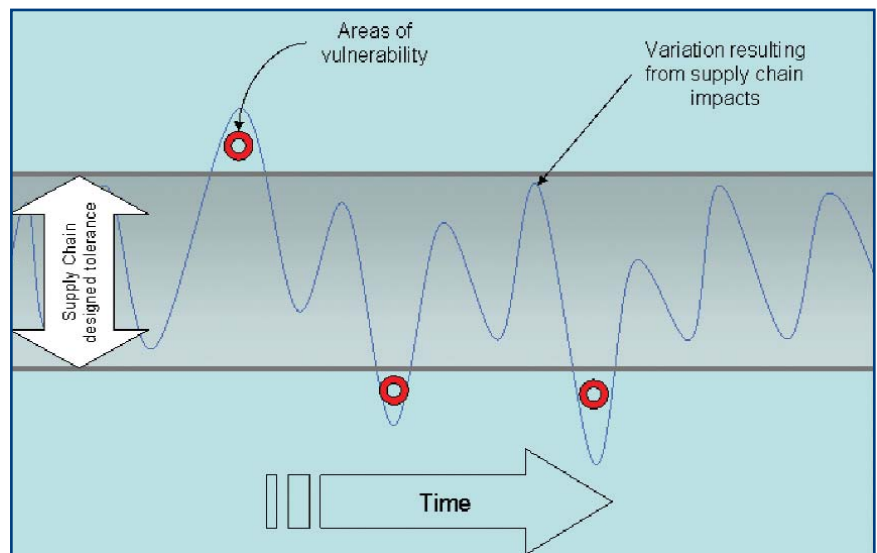
the provision of the emergency service.

Consequently, supply chain risk management aims to identify areas of potential risk and implement appropriate actions to contain that risk. It can be defined as: “the identification and management of risks within the supply chain and risks external to a co-ordinated approach amongst supply chain members to reduce supply chain vulnerability as a whole”¹

There will always be an inherent tolerance built into any network (which results from the assumptions/design parameters made when they were set up) but if any effect causes an impact outside of the natural tolerance a point of vulnerability will occur. In complex networks there may be multiple points of vulnerability occurring at any one time in different parts of the SCN, and potentially a compounding effect may begin to happen, for example, low inventory x product advertising x August annual supplier shutdown = especially high vulnerability.

A key factor affecting the seriousness and impact is the duration of the exposure outside normal tolerances and the ability of the SCN to return to its original state, and the time it takes.

Vulnerability of an individual supply chain (part of a complex supply chain matrix)



(Developed by members of the CIPS Supply Chain working party group)

The object is to maintain performance within the upper and lower tolerance limits (as shown on the diagram above) and to recognise and correct these points of vulnerability quickly before they create a significant risk.

Supply Chain Vulnerability has to be viewed in the context of overall business needs. Its importance must be related to its effect on shareholder value, ie its effect on the profitability and competitiveness of the business. Supply chain is the process by which value is created in an organisation. It therefore has to perform well.

This impact on shareholder value has prompted new corporate governance law (e.g. the Company Law Reform Bill², UK Presidency³, Regulations to implement the OFR S.I.2005/1011⁴), which requires large organisations to have processes in place to identify and report real risks in their supply chains.

All of these principles apply to service as much as they do to product, eg providing information, consultancy, training, teaching etc. A good example to emphasise this point is the significant problem with Abbey's Postal Independent Savings Account (ISA). The supply chain for transfer of ISA's from other institutions appeared to break down because of unexpected levels of demand. An Abbey spokesperson said: "We were overwhelmed with the demand and are still having various administrative problems with those who are transferring funds from another ISA provider or from an Abbey account into an ISA."⁵

Causes

Business practices may have inadvertently contributed to increased vulnerabilities in the SCN. Some recently adopted practices in supply chain management have improved the efficiency of internal and external supply chain networks. Increasingly sophisticated techniques supported by technology have supported and enabled the following:

- Just in Time (JIT)
- stockless production
- lean manufacturing
- supplier base reduction
- globalisation
- increasingly complex SCN's
- outsourcing
- Enterprise Resource Planning (ERP) system
- partnerships

However, concerns have increased over the last few years that in an attempt to become more efficient, reducing or eliminating waste and buffers in various forms and attempting to reduce the risks associated with poor supplier performance, has meant that other less obvious risks to the supply chains have been overlooked.

As organisations have outsourced globally to focus on core competences, and seek out technical innovation and low cost resource, this has led to a potential loss of control, visibility, transparency and increased distance from the market. Unwittingly organisations may have created, or become part of, supply networks that are increasingly vulnerable. As outsourcing can exceed 80% of all the processes required to deliver a product or service, the primary risks to an organisation's success will come increasingly from their SCN.

Similarly, techniques leading to lean supply networks

may have become increasingly fragile and as a result those same supply networks may have significantly increased the susceptibility to externally derived risks (if for any reason there is a stock out of a product, for example) or external disruptions. Such disruptions can have a significant - if not catastrophic - impact on the organisation.

Sourcing and supply base management also have an effect on vulnerability by increasing dependency on fewer suppliers. This can be a hidden consequence of outsourcing, supplier rationalisation or product harmonisation.

Other factors that contribute to SC vulnerability are (this is not a definitive list but only for example):

- External corruption of the SC, eg fraud via counterfeit products.
- Quality failure
- Lack of visibility along the full length of the SC
- The global economic and political situation
- "Silos" in both the customer and supplier organisations, ie disjointedness in the SC (e.g. through products which are not designed for manufacture, and generate high cost and/or quality losses)
- Market regulation (quotas, taxes etc)
- Disconnection between an organisation's strategy and the practical application of SCM
- The difficulties in planning and forecasting demand
- Designing the SC system to be more flexible and reactive and responsive (e.g. to seasonality, fashion etc)
- The dependency of organisation on IT systems to manage complex SCN's, can lead to increased vulnerability. For example when changing technology, eg Sainsbury's supermarket systems upgrade, or when organisations merge SC's, eg Morrisons and Safeways take over, or when technology simply fails, eg air traffic control impact of strategic sourcing decisions (i.e. the risks in introducing new sources of supply - new sources of supply are, in effect, new supply chains)
- Market dependency on few suppliers and single critical components ("to become crucially dependent upon a material or component almost without realising it, is a common problem which could create significant SCV"), an example might be the recent health scare over the SUDAN 1 dye, which, from a single source, found its way into a chilli powder used to make a consignment of Crosse and Blackwell Worcester Sauce and then into hundreds of products across the food industry. This has also exposed an industry-wide vulnerability due to a lack of visibility of the SCN as a whole.
- Customer/supplier conflict, for example with DIY firm Focus who wrote to hundreds of suppliers ordering them to pay more toward distribution costs - mid contract



- For specifications to be accurate, they need not only for their physical features and attributes to be well defined but also to have the outputs that they are required to perform to be fully defined. They should, for instance, include other elements of the Supply Chain, for example:
- the volumes of demand in the supply chain/network,
- the capacities in the supply chain/network, and
- Outsourcing (and therefore losing knowledge and experience of) the SC activity
- Risks in buying blindly (i.e. not understanding where the source of supply is coming from) and cheaply
- Consideration of the balance of risk in contracts with suppliers. Purchasing people must not make assumptions about a supplier's risk responsibilities. This reinforces the point about buying blindly again. It is no good the buyer offloading the risk to the supplier unless he is sure that the supplier has the capability to manage it. Contracts will only protect to a point. For example, PFI contracts with Jarvis Construction: "Schools PFI construction projects signed with Jarvis have been delayed as a result of certain construction and refurbishment risks crystallising. The costs associated with these with the risks and delays have been a major contributor to the financial problems at Jarvis." Reference Treasury Report :-
http://www.hm-treasury.gov.uk/media/D26/34/foi_pfi_jarvis_010205.pdf
- SCV is much greater for new products than it is for existing products (also remember that a new supplier is also a new supply chain and therefore may contain significant new SCV)

Supply managers now find themselves sometimes unwittingly responsible for an increasingly large proportion of the company's total risk exposure

4. Impacts on Procurement

In the current business climate purchasing people have tended to focus on cutting costs and consolidating supply in order to simplify and gain leverage, which has an effect on SCV. Concentrating on the sourcing process can often be at the expense of considering the whole SCN. The point is that within an SCN each participant (including other functions and external organisations) has to consider all upstream and downstream links and what impact their own actions will have on SCV.

The challenge for senior supply chain managers is to recognise the full scope of the SCN and the vulnerabilities they face, and to then mitigate and manage them. Vulnerabilities can only be managed if the organisation, and the network, has the necessary supply chain capabilities (ie skills, processes and

contingencies). This is far more extensive than good ERP systems or robust processes, and driven by the competences of the people involved. However the dynamics of outsourcing and downsizing may have reduced and fragmented the skills base required to effectively manage SCV.

5. Practical Steps to Improving SCV

Senior procurement professionals must therefore take positive actions to identify SCV's and manage the resulting risks, practical steps include:

- Learn from previous experiences of SCV ("how well is our process working" . Use all non-conformance events as a way of checking if the SC network is working as expected. Learn from these events; use them to improve SC understanding and resilience.
- The best source of information to finding these practical steps is to learn from previous experiences inside the organisation. The buyer should be constantly checking on how well the current process for supply is working. Whenever there is a non-conformance event, then this should be fully analysed in order to discover what went wrong and thereby learn from the mistakes.
- A close knowledge and understanding of markets and suppliers will enable easier and more proactive management and increase awareness of emerging SCV issues
- Learn from the experience of others (Benchmarking).
- Prioritise effort via risk evaluation (see the CIPS position on practice for Risk Management on www.cips.org)
- Assess the impact of SCV versus the chances of it happening in order to determine the impact on the customer and set priorities for time and attention. It is not necessarily the biggest value supplier but the biggest risk supplier who is priority
- Avoid doing too much at one time, prioritisation is vital
- Cause and effect. Actions have reactions. We cannot assume a benefit (e.g. changing supplier for a saving) has not got a cost or a consequence. For example how the supplier will respond to recover margins after a significant price reduction.

The following all contribute to SCV and therefore all need to be effectively managed.

- Quality control systems
- Planning and forecasting
- Risk management policy
- Ethics
- Supplier selection



- The effects of the specification on downstream supply. Output based specifications are much more likely to address the most important and basic need to accurately reflect the requirements of the final consumer at the point of supply handover within the supply chain/network. This focus potentially brings much greater alignment of specification to consumer needs.
- The supplier should then build the supply chain/network to deliver those outputs (which can then be codified in terms of both specifications and service level agreements) rather than him building the supply chain/network to meet a specification which may result in distortions to supply. The supplier will increase SCV if he does not closely match the specification. An example might be a buyer of plastic components arranging a rebate deal with a plastics company which has the effect of directing his/her injection moulders to a grade/type of plastic which is different to the type they are used to and thus increasing SCV because of performance, quality, accountability and relationship issues.
- Get rid of silos (departmental focus) - take a virtual team approach. Ensure effective working cross functionally (across departments), internally and externally, effective communication and maximum transparency. A good example of multi-functional working is that of cross-functional teams at BAE Systems where commercial, procurement, technical, logistics and sometimes others work together in a co-ordinated approach to manage and solve supply problems from design to manufacture and delivery of original equipment to customers, as well as supporting customers with training, repairs and spares support after the original equipment sale. Supplier and customer 'teams' involved in this multi-functional approach could be included too.
 - Ensure effective resourcing (quantity and capability)
 - Consider alternative supply chain solutions, eg

Spanish retailer Zara has hit on a formula for supply chain success that works. By defying conventional wisdom, Zara can design and distribute a garment to market in just fifteen days. From Harvard Business Review.⁶

- Raise awareness of SCV within;

1) whole supply chain

In considering development of sourcing strategy consider the following factors:

- The globalisation of supply chains

There has been a rapid shift in recent years away from a local supply base, due to the opportunity to source globally, and to offshore manufacturing. Assembly supply chains can now stretch the globe. It is usually

cost that drives the decision to offshore the manufacturing process. However it is rare that the total supply chain costs are considered. Often there is an increased risk in a global supply chain in terms of extended lead-times (to cover delivery), resulting in greater buffer stocks.

- Focused factories and centralised distribution
It is common today for companies to dedicate a factory to produce a few mass-produced products at a certain site rather than having each factory produce a full range of products. This may result in lower production costs but the flexibility may be lost as the factory is designed to produce large batches to achieve maximum scale economies

Along with the move to fewer production sites has come the centralisation of distribution. Manufacturers of fast moving consumer goods aim to serve their market through a few centralised distribution centres.

- The trend to outsourcing
During the 1990's there was a trend to outsource non-core competences, which could include anything from components manufacture to payroll services. This move was intended to add value to an organisation in terms of overall cost and quality and to allow organisations to focus on their competitive advantage. This is leading to network organisations where companies are linked together by shared information and aligned processes to achieve greater overall competitiveness.

There is a potential risk in outsourcing in that a loss of visibility and control can occur. Further there is a proliferation and complexity of supply networks. Disruption in supply can be attributed to the failure of one of the links in the supply chain, so when a supply chain network becomes more complex with more links introduced, there are potentially more points at which the supply chain can fail and hence a greater risk of overall failure.

- Reduction of the supplier base

Another trend over the past decade has been a dramatic reduction in the number of suppliers from whom an organisation will procure components and services; in some cases there is only a single source of supply, a good example which illustrates the potential problems of this can be found at <http://news.bbc.co.uk/1/hi/business/1827531.stm>.

There can be benefits to reducing the supplier base in terms of control, the cost of managing suppliers, leverage, etc. but it must be recognised that it can also bring considerable risks in terms of a single source supplier failing to supply.

- Volatility of demand
Shorter life cycles, often driven by technology change, promotions, sales incentives, all contribute to the



volatility of demand. Also batch sizes, lead times, delivery frequencies, lack of visibility of real-time demand down the supply chain further contribute to volatility and unpredictability of demand in the supply chain.

Forecast driven companies with long planning horizons and long lead-time responses are increasingly vulnerable to wild swings in demand. In 2001 Cisco, the world's leading supplier of electronic network equipment, had to write off US\$2 billion because of a huge fall-off in demand for its products.

- Lack of visibility and control procedures

Lack of visibility and control in supply chain networks can result in a lack of confidence that adds to supply chain risk. Lack of confidence in the supply chain can actually increase risk. Lack of visibility in the supply chain results in its members being reliant on forecasts and building up buffers which, as we have described above, can increase vulnerabilities and risks throughout the SC.

Supply chain control refers to the ability to respond to disturbances in an appropriate way. There are often time lags when disturbances are not identified quickly enough or when the remedial action takes time to take effect

2) Working with suppliers and encouraging good practice down the SC

6. SCOPE

For the purposes of this paper, vulnerability is a point of weakness that can lead to a business risk. Therefore, managing SCV requires an understanding of business risks and how to identify and manage them.

Risk can manifest itself in a number of ways, the main types of risk are;

- 1) Commercial risk - such as allowing suppliers to contract on the basis of cost plus, inappropriate choices of shipping terms for imports and exports
- 2) Process - reconciling supply with demand
- 3) Operational - not having materials
- 4) Strategic - inappropriate product for market
- 5) Financial - insufficient funding/fraud. Foreign trading and currency transactions not balanced
- 6) Knowledge management - lack of key knowledge of markets or IP infringement
- 7) Contractual - exposure to liquidated damages
- 8) Reputation - brand damage
- 9) Compliance

Many organisations will be looking at business planning including Business Continuity Planning (BCP) as a way to manage risks. SCV's should be managed within the framework for risk management and therefore the procurement manager involved in this

should work closely with the relevant functions within their organisations (working across functions and departments). Procurement people should look to their external suppliers to replicate risk management practices within their own business, ie it is an external as well as an internal view.

The white paper Achieving Resilience - Best Practices in Business Continuity written by AT&T in co-operation with the Economist Intelligence Unit (EIU), found 3 key findings from extensive research they had supported 5 universities to conduct. The objective of the research was to help organisations identify and quantify risks and vulnerabilities in the supply chain and then implement procedures, strategies and tactics aimed at ensuring business continuity. The key findings of the research are summarised as follows:

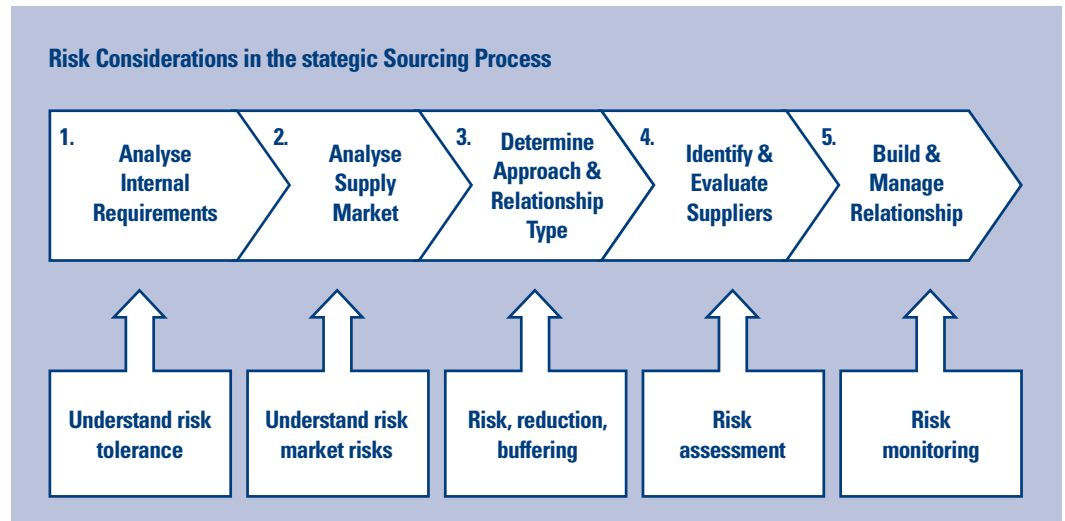
- The news media headlines may focus on single catastrophic events, but smaller more mundane risks are usually responsible for business disruptions. As a result, companies are shifting their focus from disaster recovery - the restoration of damaged assets - to business continuity planning (BCP) - the uninterrupted provision of operations and services to end-user customers.

- Information technology dominates thinking on BCP, and industries that are heavily dependent on IT tend to be furthest along the BCP path. But IT should not push aside other elements of BCP, such as communications with employees, alternative work processes and interaction with customers.

- A static business continuity plan will not protect a company from disruption. An integrated and ongoing enterprise-wide plan, with assumptions that are regularly tested and that keep pace with the risks prevalent in the business environment, is needed to achieve this goal.
- Increased use of IT, the globalisation of supply chains and the integration of networks of companies into "extended enterprises" have helped reduce companies' exposure to a catastrophic "single point of failure" disaster. An extended geographic footprint and an increase in information flows within and between business mean that companies can diversify and manage risk more effectively than ever.
- Unfortunately, these same trends can spawn less dramatic but equally damaging risks of their own. As more enterprises rely on extended supply chains, for instance, managers are coming to realise the true impact of supply-side disruptions.

It is necessary, therefore, for organisations to be aware of where the vulnerabilities are in their supply chains, the sources of risk and how that risk can be managed to increase control and confidence in the supply chain.

Supply Chain Vulnerability



This diagram is taken from the white paper Effective Practices for Business Continuity

7. SUMMARY

The increasing complexity of SCN's due to factors such as globalisation and outsourcing has resulted in several recent high profile cases highlighting SCV issues.

As SCV is a point of weakness that leads to a business risk then this should be managed within the frameworks that already exist to manage risk. In a lot of cases this framework is only developed adequately following a vulnerability, which develops into a serious risk and disruption for an organisation.

Within an effective risk framework the first thing is to create awareness, which is developed when a firm recognises that it is exposed to risk of supply chain disruptions, and realises the potentially serious consequences of such disruptions. The awareness must develop internally at multiple levels of management so resources can be allocated and appropriate processes and tools can be developed and deployed to manage the risk. Further it is important to push this awareness out into the supply chain to customers and suppliers so their help can be enlisted in the effort to manage the risk.

The second element is prevention. The focus here is reducing the likelihood and/or the impact of supply chain disruptions. Prevention comprises of four key processes:

- 1 Risk identification: carefully enumerating the various causes/sources of potential supply chain disruptions.
- 2 Risk assessment: evaluating the likelihood of occurrence and the impact that each event will have on the business for each cause or source of potential disruptions.
- 3 Risk treatment: prioritising the various causes/sources of potential disruption and developing strategies for reducing their likelihood and/or mitigating their impact on the business.

- 4 Risk monitoring: monitoring on an on-going basis, developments in the supply chain that may increase or decrease various risks.

The third element of the continuity-planning framework is remediation. Firms need a course of action to follow in order to recover from a disruption when it occurs. The firm should consider how it might shorten the duration of the disruption and minimise its impact on the business. The resources needed to carry out this plan should also be identified.

The last element in the framework is knowledge management. When supply chain disruption occur, it is important that the firm learns from the experience. This means that lessons learnt from past events should be captured. This will allow a firm to evaluate if their plans were adequate and allow management to review what happened and to essentially carry out a debriefing.

Business continuity planning for the supply chain should not be viewed as a separate independent planning activity. Rather it should be seen as an integral part of a firm's strategic sourcing process. At each stage in the strategic sourcing process there are risk management considerations that should be an inherent part of the process.



8. REFERENCES

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- 3 <http://www.dti.gov.uk/cld/ukpresidency.htm>
- 4 <http://www.opsi.gov.uk/stat.htm>
- 5 LSE Report December 2004
- 6 <http://hbswk.hbs.edu/item.jhtml?id=4652&t=operations>

9. FURTHER READING

CIPS Position on Risk Management (www.cips.org)
`Planning in Purchasing and Supply Management Paper by George A. Zsidisin, Cary L. Ragatz and Steven A. Malnyk)

Achieving Resilience -
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A Literature Review -
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A Practical Guide -Centre for Logistics and Supply
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Research Funded by the Department of Transport

Managing Business Risk -
A Practical Guide to protecting your business -
Consultant editor - Adam Jolly, foreword by George Cox
Director General, Institute of Directors
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