



Focus

December 2013

Supply Chain and Contingent Business Interruption (CBI) A perspective on Property and Casualty



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and
Contingent Business Interruption (CBI)
A perspective on Property and Casualty

SCOR



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Foreword

Our 2012 seminar provided a chance to reflect on the record breaking catastrophe losses of 2011 and our focus was on catastrophe loss modelling and risk models. A key aspect of the impact of those catastrophes and the more recent Superstorm Sandy has been to draw a focus on the nature of modern **supply chains** and Business Interruption exposures and losses. So for 2013 we took as our theme **"Supply Chain and Contingent Business Interruption"** to offer a perspective on property and casualty issues. Our seminar drew in experts from supply chain consultancy, risk management, loss adjusting and academia. This group of external speakers joined with many specialist members of the SCOR team to debate and discuss ideas and possibilities around **CBI** and **modern supply chains**.

Our two main principles were to learn from our shared experiences and to consider and share thoughts as to where we might go next. This SCOR focus report is based on the presentations made by speakers and panellists at our conference and its purpose is to be a record of the event and to provide a wider audience with the chance to share in the experiences that all present in SCOR headquarters in Avenue Kleber joined in with. The report is not an academic document of theory but is drawn from the broad based practical experience that each of the presenters brought to the occasion.

A risk manager will inevitably see insurance as an important component of the **risk management** approach and **Contingent Business Interruption insurance** is a key tool to reduce the financial impact on a corporation of an incident. As businesses around the world have moved from a vertically integrated model to a horizontal model in which they focus on their core skills and rely on an outsourced supply chain so the nature of risk has changed. The modern corporation will tend to be an **international or multi-territory operation** with a **supply chain extending across multiple suppliers** and **multiple flows of business**. The nature of the **global environment** is one of increasing **interconnectedness** and this also changes the nature of risk. So a key element of the conference was to look at the **resilience of the modern business model** with an in-depth look at two key industries to help guide understanding.

Whilst we can say that thoughts of both **BI** and **CBI** are not recent, with evidence of **risk pooling** going back to the start of business in 3,000 BC, we can say that the concepts are under the microscope and potentially in need of updating. There has been **global supply chains** since the days of the Silk Road and the Indian outposts but supply chains are an increasingly complex and multi-faceted fact of life.

To call Contingent Business Interruption **"CONTINGENT"** may seem confusing as most Business Interruption insurance is contingent upon something happening and this is usually **material damage**. Where **CBI** has stood out from **BI** covers in the round has been that it provides cover that is **"contingent"** on damage occurring at a supplier's or customer's premises. **CBI** can be contrasted with **BI** covers extending to **Interdependencies** which are about link(s)/interactions between different production operations within a plant, or and between locations within the company or corporation. This aspect is not the primary focus of the event but it is clearly a subject to which we will return on another day.

We split our conference over 2 days and on day one considered how we could *define, assess and illustrate the key issues surrounding CBI*. For day two the attention turned to *how to mitigate and risk-manage CBI risks*. The opening theme was to consider “*How have the globalization of trade, consumption and the economy led to the relevance of CBI?*” For all at the conference it was clear that *Globalization* is here to stay and is expanding across all industries in some shape or form. Drivers can include cost, specialization, changing trade agreements and tariffs and it is clear that there is much that can be reviewed as we return to this subject in the future.

New *risk frameworks* which can improve the capability to analyze and assess risk were demonstrated and will no doubt be woven into our future thinking on the subject. Defining and understanding the cover and exposures is a core of the *risk control programme*. The conference delegates took time to hear from speakers as to what might be learnt from recent events in Thailand and New York. All aspects of the *insurance value chain* were represented from *product design* and *pricing* through *risk control, underwriting and claims*.

A final theme was how we might see a *supply chain* analyzed through a *Property (re)insurance approach* to identify internal and external risk factors and most critical scenarios in normal and stressed operating conditions. Our purpose was to stimulate debate and discussion and we believe we delivered to this objective. There is no doubt that the insurance of financial risk of the type insured by *CBI* programmes is a vital tool for the risk manager and we are pleased to have been able to help add to the understanding and appreciation of the subject.

In closing we must thank all of those who made this conference such a success, our speakers and panellists and of course our delegates. We are delighted to be able to produce this report of the conference and you will find the biographies of speakers included in this publication.

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*The views and statements expressed
in this publication are the sole
responsibility of the authors.*

1

HOW HAVE THE GLOBALIZATION OF TRADE, CONSUMPTION AND THE ECONOMY LED TO THE RELEVANCE OF CBI COVERAGE?

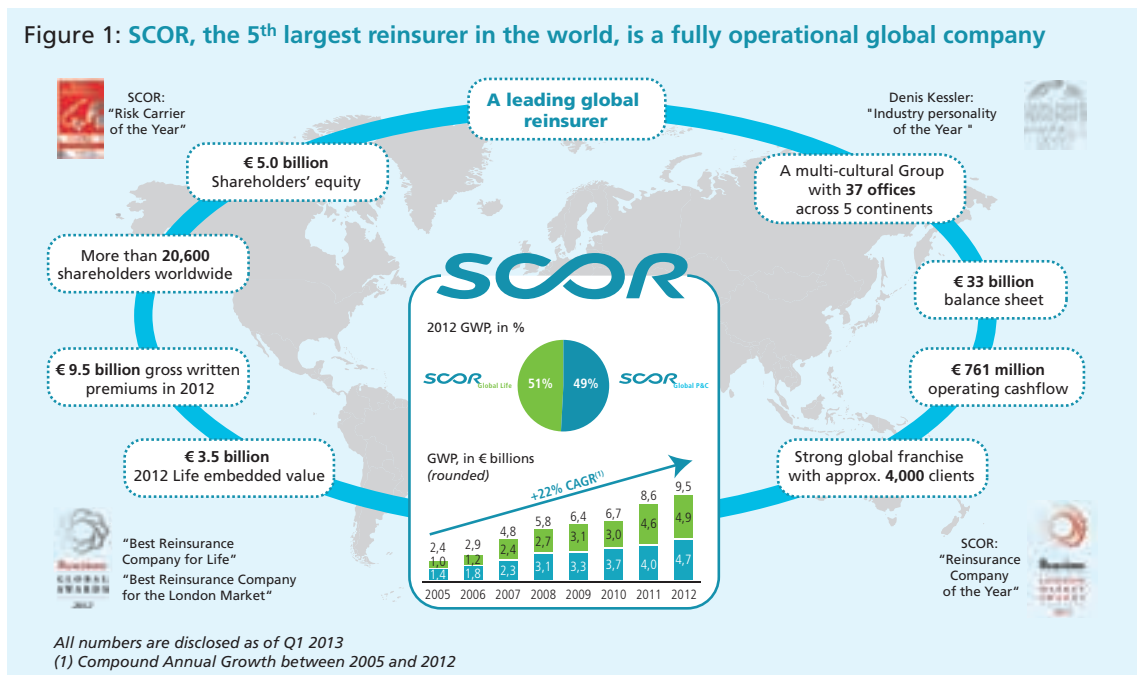
DENIS KESSLER
 Chairman and Chief Executive Officer
 SCOR SE

Presentation of SCOR

SCOR is a top-five global reinsurer, with premium income expected to cross the € 10 billion threshold in 2013. Total assets measured in excess of € 32 billion as of H1 2013. The Group has a balanced business model with three

powerful engines: SCOR Global Life (life reinsurance), SCOR Global P&C (non-life reinsurance, combining reinsurance with direct and facultative P&C business) and SCOR Global Investments (asset management).

Figure 1: SCOR, the 5th largest reinsurer in the world, is a fully operational global company

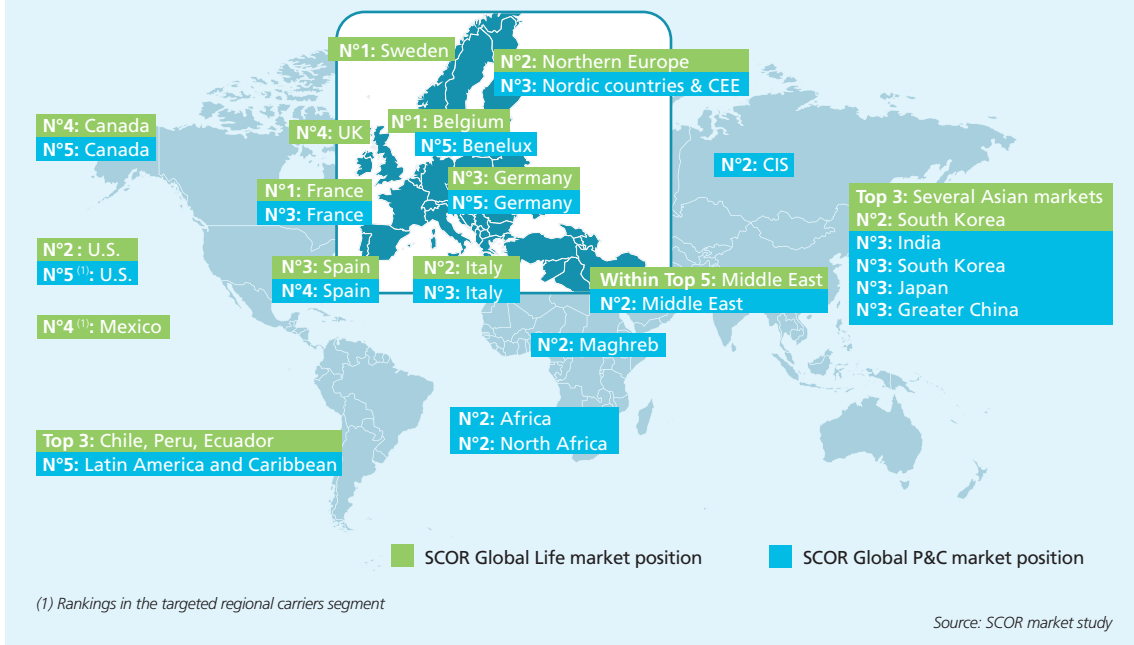




The Group's six-hub structure (Americas, Cologne, London, Paris, Singapore and Zurich), bears witness to the company's decentralized, multicultural and global nature, which is well-suited to the international reinsurance business.

The Group maintains 37 offices in total, spread across five continents. SCOR is committed to working with its clients on a long-term basis, and this structure enables the Group to provide high added value and innovative, tailor-made solutions.

Figure 2: SCOR Global P&C and SCOR Global Life are further consolidating their top-tier positions across the globe

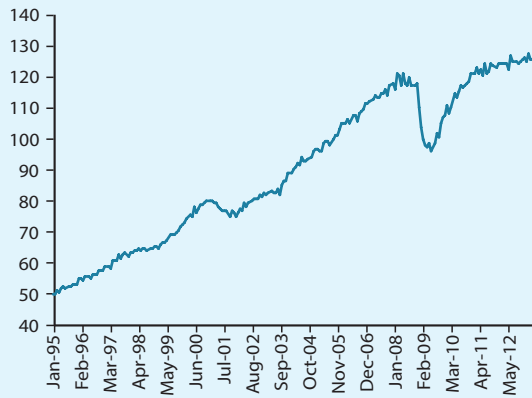


Globalization and the emergence of complex global supply chains

A DRAMATIC GROWTH

Global trade has grown dramatically over the last few decades. As shown in the graph below, world imports doubled in volume between 1995 and 2005, with a sharp decline in 2008 due to the economic and financial crisis. World trade bounced back very quickly, however, and was back to its pre-crisis level as early as 2010. Since then, the volume of world imports has grown by 10%.

Figure 3: World imports in volume (2005=100)

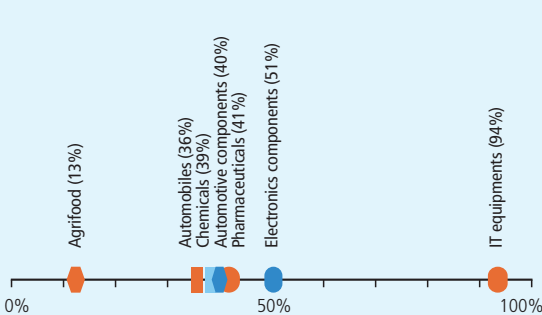


Source: CPB, Thomson Reuters

A PHENOMENON IMPACTING MORE AND MORE INDUSTRIES

Globalization is progressively spreading to all industries. Looking at the past decade, IT equipment and electronic components have led the way. For instance, 94% of the IT equipment manufactured during that period was exported.

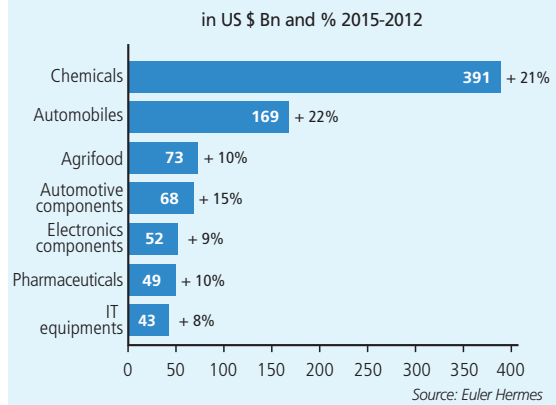
Figure 4: Share of exports in turnover by sector (2000-2012 average)



Source: Euler Hermes

While exports usually represent a much smaller share of production in other industries, many industrial sectors are now catching up very rapidly. According to Euler Hermes, chemical imports are expected to grow by 21%, automobile imports by 22% and agrifood imports by 10% between 2012 and 2015.

Figure 5: Growth in import potential by sector (in 2015 compared to 2012)



Source: Euler Hermes

PROSPECTS FOR GLOBAL TRADE

Free trade today has lost some of its momentum due to protectionist measures in the wake of the global financial crisis. In 2012, according to McKinsey, global cross-border capital flows were still 60% below pre-crisis levels, suggesting a re-fragmentation that could spread to the goods and services world.

Figure 6: Global cross-border capital flows (1) (US \$ trillion, constant 2011 exchange rates)



(1) Includes foreign direct investment, purchases of foreign bonds and equities, and cross-border loans and deposits.

(2) Estimate based on data through the latest, available quarter (Q3 for major developed economies, Q2 for other advanced and emerging economies). For countries without quarterly data, we use trends from the Institute of International Finance.

Source: International Monetary Fund (IMF) Balance of Payments; Institute of International Finance (IFF); McKinsey Global Institute analysis

Moreover, trade negotiations under the aegis of the World Trade Organization have largely reached a stalemate. Rising labour costs in emerging markets may weigh on imports too.

However, nations trade more, not less, as economies become larger and more similar: intra-EU trade accounts for two thirds of total EU trade; France's main trading partner is Germany, not China. This is because countries with identical production costs reap numerous benefits from trading with each other, including economies of scale (firms that supply bigger markets are more efficient than those that focus purely on their own countries).

All in all, global trade looks set to continue to grow faster than world GDP in future years, albeit possibly at a slower pace than in the past.

Figure 7: Annual growth in GDP and world trade



Source: HIS Global Insight, Euler Hermes forecasts

THE FACTORS BEHIND THE GROWTH OF GLOBAL TRADE

There are various factors behind the growth of international trade.

Reduced tariffs and bilateral and multilateral trade agreements have played an important role. As a result, tariffs have decreased dramatically over the last few decades. While in South Asia tariffs reached almost 50% on average at the outset of the 1990's, they have

now decreased to less than 15%. This downward trend can also be observed in much of the rest of the world, including Africa and the Middle East.

Simultaneously, bilateral and multilateral agreements have facilitated direct foreign investment, which has grown massively as shown in the diagram below. As a result, many companies have become global.

Figure 8: Tariffs applied in emerging countries

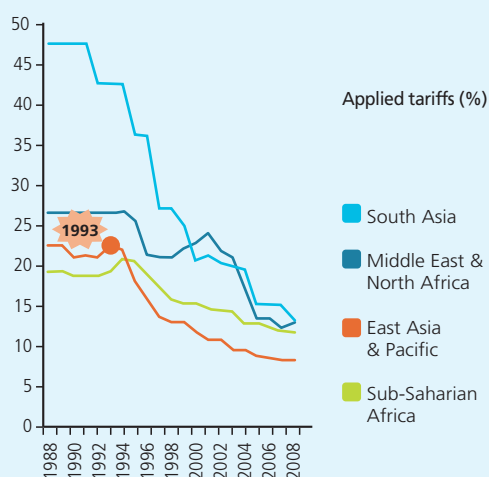
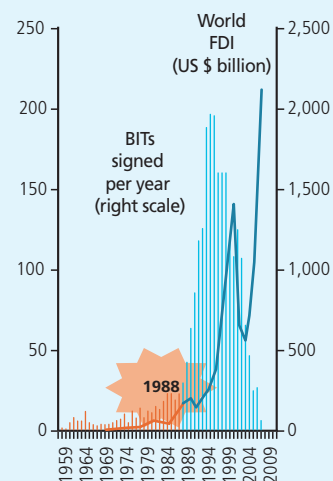


Figure 9: Bilateral investment treaties and global foreign direct investments



Source: R. Baldwin, Oxford university

Governments have pushed through these reforms because opening frontiers to international trade is usually beneficial for all parties. International specialization allows each country to make the best of its comparative advantages such as labour costs, manpower proficiency, access to raw materials, the cost

of energy, and so on. By joining global supply chains, developing countries in particular have reaped a double benefit: on top of the immediate benefit from trading goods, many of them have been able to move up the value chain year after year.

Other factors that are sometimes unfairly overlooked have also played a major role in the growth of international trade.

This is the case with the reduction in the cost of logistics. In 1956, the introduction of containers reduced the cost of shipping from US \$ 5.83 to US \$ 0.16 per tonne for loose cargo, which was an incredible development and a radical change. Then the proportion of countries equipped with container ports rose from about 1% to nearly 90% between 1966 and 1983 (source: The Economist). The trend is still continuing today: fifteen years ago, Africa had virtually no sophisticated port equipment, while

today it hosts an impressive number of modern and efficient ports along the coasts of Gabon, Senegal and Ivory Coast.

Information and communication technologies have also had a powerful effect by reducing coordination costs. They have made it possible to manage, in real time, global supply chains spanning continents.

The harmonization of norms and standards has also played a role. But more progress could be achieved here. According to the World Bank, the removal of non-tariff barriers could contribute six times more to global trade than the reduction of tariffs.

The vulnerability of global supply chains – insurance solutions

NEW, GLOBAL SUPPLY CHAINS

Global supply chains have undeniably existed for a very long time, good examples being the Silk Route and the trading posts in India. But until recently, trade consisted mainly of raw materials and end products. The manufacturing process itself remained centralized.

The latest globalization trend is different from previous ones. Today, estimates show that intermediate goods account for about 75% of the international trade in goods, i.e. US \$ 8.5 trillion out of a total of US \$ 11.5 trillion, according to the World Bank. This reflects the globalization of supply chains, beyond the globalization of trade itself.

Supply chains are increasingly complex and involve many different kinds of links and interactions: supplier vs. customer dependency, internal (within a group) vs. external suppliers/customers. Consequently, a supply chain diagram now looks like an impossibly complicated spider's web, in which even a spider would have trouble finding its way around.

Figure 8: Complexity of supply chains



THE VULNERABILITY OF SUPPLY CHAINS

The development of sprawling global supply chains around the world has created multiple challenges. As much as the supply chains are global, they are also vulnerable.

The vulnerability of supply chains is due to a number of different factors, one of which is trends in manufacturing. The current trend in production is to have zero stockholding, in order to reduce the cost of inventories. However, this creates vulnerability since there are no buffers to mitigate a disruption in production. Moreover, high levels of automation create a vulnerability to the failure of automatic processes. Lastly, increased integration in manufacturing processes (design of components, etc.) has led to greater interdependencies between different business partners.

Concentration makes global supply chains even more vulnerable. Over the past few years, the business world has witnessed distinct consolidation trends in many industries. In the automotive industry for instance, there were 12 major companies in 2008 as opposed to 23 in 1988, and the 600 major suppliers operating in 2001 went down to just 22 in 2008. This consolidation of industries drives a new type of risk because there are fewer suppliers and fewer producers, and therefore fewer alternatives in the event of a disruption.

Geographic concentration is also an issue. An enlightening example is the Silicon Sea Belt, where 50% of the world's semiconductor production is located in a very tight belt stretching from Japan to Singapore, via China, Taiwan and South Korea. This part of the world is highly exposed to natural catastrophes such as typhoons, tempests and tropical storms. Similarly, China regions such as the delta of the Pearl River and Shanghai represent a major risk because they concentrate huge amounts of wealth and interact with the rest of the world.

The 2011 Thai floods were an acute reminder of the vulnerability of global supply chains: the floods forced Toyota for instance to slow down production in its factories in Indonesia, Japan, Malaysia, Pakistan, the Philippines, South Africa, Vietnam and North America. This situation could have been anticipated by public authorities if they had located industrial parks in areas less prone to flooding. The fact is that industrial parks were located outside the cities in rice fields. Since rice grows in water, these regions are by definition at risk of flooding. Geographic concentration was also an issue: in 2011, Thailand was the world's second largest producer of hard disk drives, accounting for approximately 25% of global production.

INSURANCE SOLUTIONS AND RISK MITIGATION

The vulnerability of global supply chains is becoming a key concern for all companies: with the development of risk management professionals, companies are now realizing that supply chain disruptions are a major risk. Hence the demand for insurance solutions such as Contingent Business Interruption covers.

For (re)insurers, Contingent Business Interruption risks have the potential to compound the impact of natural catastrophes and are a major cause for concern: (re)insurers have to pay not only for natural catastrophes per se on the Property side, but also for Business

Interruption and Contingent Business Interruption, which can generate huge losses all along supply chains due to ripple effects. In the past, CBI cover would typically be triggered by isolated perils, such as a fire destroying a single plant. But today, the major threats come from natural catastrophes to which insurers are already exposed via Property covers.

Prevention and risk mitigation measures are key. Insureds may for instance diversify their suppliers. Public authorities, too, have an important role to play. In this regard, a return to basics should be recommended: public authorities should abstain from delivering building permits for sites exposed to natural catastrophes.

It is also essential for risk managers, brokers and insurers to carefully map all links and interactions within supply chains in order to carefully assess the risks involved. In particular, insurers must take the time to understand all these interactions before providing blanket coverage. Public authorities also need to map potential hazards in order to improve the information available (i.e. mapping of flood-prone zones). One of the issues the industry faces today is that many countries still do not have precise and adequate information about their exposure to natural catastrophes. It is therefore absolutely necessary to spend resources, money and time on better understanding exposure to all types of perils.

Conclusion

The vulnerability of global supply chains is a growing source of concern, including for governments. In January 2012, the US Department of Homeland Security published a "National strategy for global supply chain security", thus recognizing that supply chain disruptions pose a risk not only to the economy but also potentially to national security.

In order to deal with this risk, cooperation between all stakeholders is required. SCOR is ready to contribute to these efforts.



2

END TO END SUPPLY CHAIN RISK: UNDERSTANDING DRIVERS AND RESOLVING COMPLEXITY

CATHERINE GEYMAN
Director
Intersys Ltd

Understanding and accurately quantifying both Business Interruption and Contingent BI exposures has long been a challenge to risk managers and insurers alike. This challenge has increased substantially over recent years with the ever growing complexity of global supply chains. However, complexity is not the only factor preventing risk managers from accurately evaluating the risks and insurers from getting the values that they need to accurately underwrite a risk.

The principle barriers to quantified supply chain risk assessment and proportionate management are:

Commitment: Lack of commitment from Senior Management to mandate a formal interruption assessment process that unifies different parts of the organization.

Visibility: An incomplete picture of the supply base outside a company's direct control for critical revenue streams.

Volume: Some companies endeavour to assess **all** suppliers, rather than focus on those that meet certain criticality criteria.

Data: An ill founded expectation that Enterprise Resource Planning systems will hold all the answers.

The visibility imperative

The first two challenges are well illustrated by an Economist Intelligence Unit research program sponsored by KPMG International which was conducted in November 2012; "Global Manufacturing Outlook Competitive advantage: enhancing supply chain networks for efficiency and innovation". This report is based on a survey of 335 senior executives from 5 industries: Aerospace and Defence, Automotive, Conglomerates, Engineering and Industrial Products, and Metals. It contains some interesting supply chain risk related statistics:

- 49% of survey are familiar only with their immediate Tier 1 partners; they know very little about partners beyond;
- Only 9% of respondents say their organization can assess the impact of disruptions in a matter of hours, 17% say it takes 3 weeks or longer;
- 48% say they will regionalize/ localize supply chains to improve the management of their supply chain risk.

The report suggests that whilst end to end supply chain visibility is currently lacking, and consequently the ability to detect and quickly respond to supply chain incidents is also deficient, management are becoming more committed to redressing that situation. If Senior Management can commit to the "Visibility Imperative", this would facilitate a deeper understanding of the range of exposures facing supply chains – from raw material to finished product.





Automotive industry manufacture

Supply chain interruption risks can no longer be ignored

A number of factors are converging to accelerate supply chain risk management up the Senior Management agenda. There is a major “push” for action from recent, unprecedented world events and a pull from a stark vision of the future. When these drivers combine with the current fragility of global supply chains, the call to act is compelling.

FRAGILITY

Following the economic crisis of 2008, the focus of the manufacturing sector was on survival.

- The need to reduce costs across every aspect of supply resulted in even more aggressive stock and asset base reduction initiatives (Lean Manufacturing, Just in Time (JIT), etc.).
- Consolidation activities increased, often resulting in the removal of another level of redundancy between competing products.
- Continuous outsourcing of non-core activities has resulted in cross industry dependencies on a small concentrated number of 1st tier contract manufacturers, often in geographical areas exposed to natural hazards and subject to less regulatory oversight.
- In a bid to grow, organizations have sought out new markets for expansion. These territories often come with greater geopolitical risks that make central oversight more challenging.

The net result is less resilient supply chains, exposed to a wider range of threats.

RECENT CATASTROPHES

This increased fragility has been tested in the last few years and some vulnerabilities exposed by a number of catastrophic events. The following three Business Interruption events include a traditionally insurable risk event, a non-damage threat to the supply chain and a tragedy with important reputational ramifications.

2011 Great Tohoku earthquake and Tsunami – “Traditional” CBI event

The Japanese earthquake and tsunami of 2011 had a substantial impact on the semiconductor and automotive industries. Large corporations in the electronic industry including Fujitsu, Toshiba, Hitachi were immediately impacted, together with critical suppliers to the semiconductor industry such as wafer foundries, providing the building blocks of the industry. Of particular relevance to the auto industry is Renesas Electronics, whose plant in the impact zone manufactured 40% of the chips for the global automotive micro controller market.

Another indirect supplier was a pigment factory owned by Merck which was the only factory in the world to make a Xirallic pigment used in automotive paint. This plant was in the Fukushima nuclear exclusion zone, resulting in shut down of its operations. This closure was more prolonged than the direct impact on the industry (impaired capacity, destruction of finished vehicles) and resulted in reduced dealers' and manufacturers' margins over an extended period of time.

2013 horse meat contamination – Non-damage BI event

Of utmost relevance to the Visibility Imperative is the horse meat contamination scandal of 2013 which raised key concerns about traceability, chain of custody and the general level of control over our food supply chains. The event presented some perceived risks to the consumer, but also had potential to seriously damage the reputation and revenue of certain food processing firms, including French owned Spanghero. This plant was identified as the possible source of the mislabelling issue when horse meat was effectively passed into the downstream supply chain as beef. Spanghero's manufacturing license was suspended and it was at risk of being revoked, with the potential loss of several hundred jobs.

2013 Bangladesh building collapse – reputational BI event

The building collapse in Bangladesh not only resulted in great human tragedy, when over one thousand garment workers lost their lives, but also significant financial impact for big brands in the clothing industry which sourced their clothing lines from the devastated building. Contributors to social media sites stated that they would shop elsewhere and retailers faced street protests outside their stores, resulting in reduced sales for the implicated businesses.

If global supply chains cannot evolve to be lean, as well as resilient enough to cope with today's interruption threats, they will be wholly inadequate for the future.

FUTURE FEARS

The future is not predicted to be any less challenging; the analysis of macro risk trends suggests that global supply chains are going to need to show much greater resilience if they are to adequately serve the needs of future generations. The Supply Chain Risk Leadership Council, a forum for risk managers from large manufacturing companies, has recently invested considerable time analyzing this very issue. The Council defined 13 different risks which would strain future supply chains, including world population growth, climate change, social inequity and civil unrest. All would potentially strain supply chains in terms of availability of critical resources, transportation routes and the stability of economies and social environments.

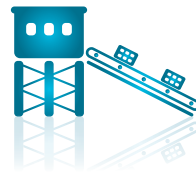
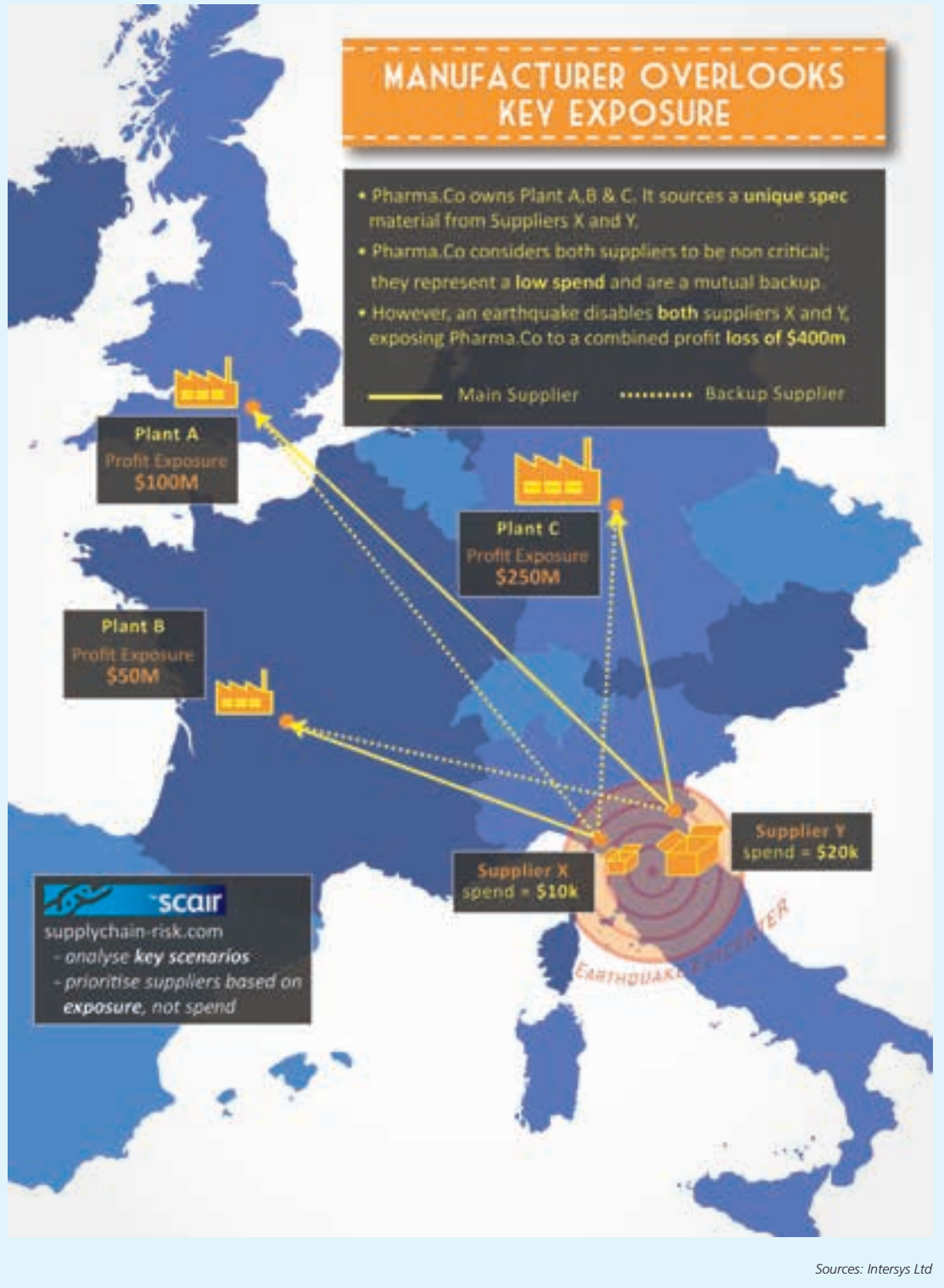


Figure 1

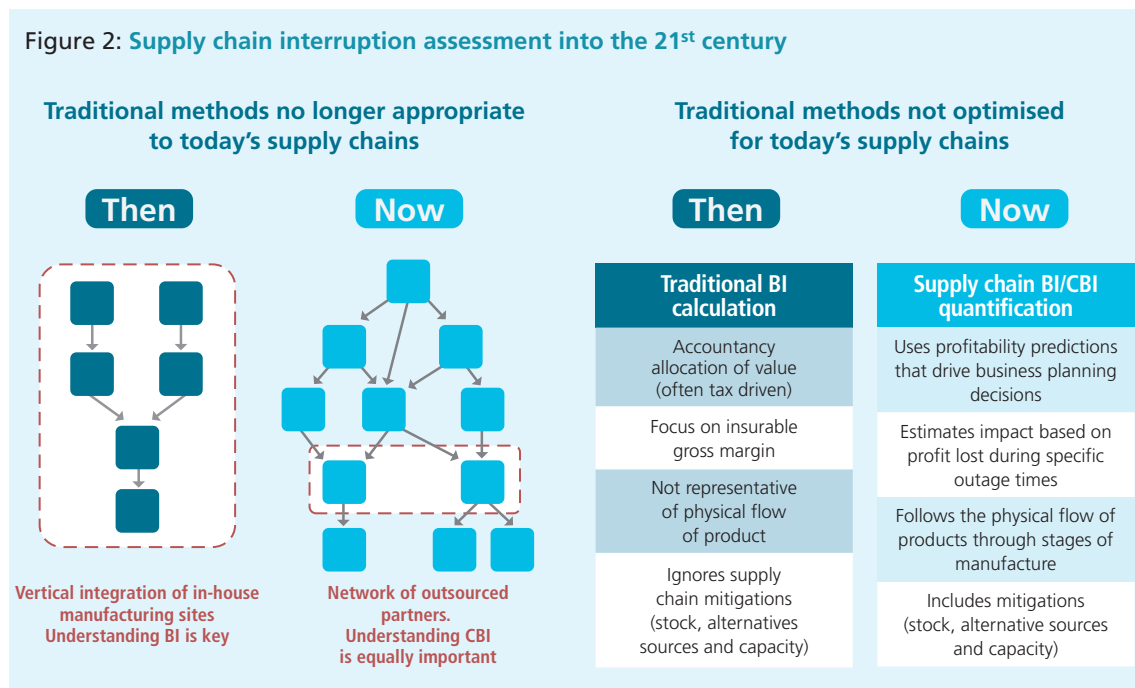


Bringing supply chain interruption assessment into the 21st Century

So the drivers for change are strong and senior management are responding to the need to understand the risks threatening the length and breadth of their supply chains. The next challenge is the selection of an appropriate, sustainable methodology to pinpoint the most critical supply chain vulnerabilities, quantify exposures and adopt proportionate measures to mitigate them.

A risk manager is well versed in the quantification of “value at risk”. This puts him or her in a very good position to respond to future demands arising from the need for greater supply chain visibility. However, the risk manager’s tool box needs updating. Supply chains have evolved, but supply chain risk quantification techniques have not.

Figure 2: Supply chain interruption assessment into the 21st century



In the past, when large companies were more vertically integrated with plenty of in-house manufacturing capability, understanding Business Interruption was a central part of the risk manager’s job. Today, supply chains are more externalized and collaborative with greater dependency on outsourced partners. Consequently, the understanding of CBI exposures needs to be equal to if not more important than BI exposures.

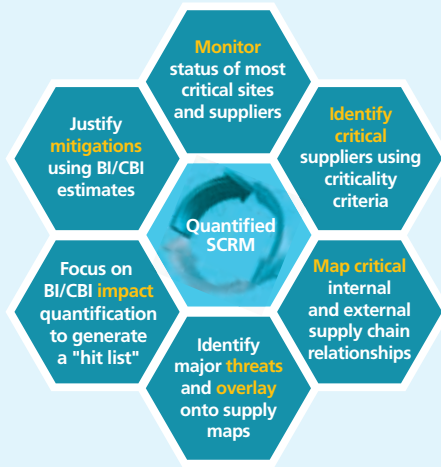
Traditionally, accountancy based methods have been used to estimate BI exposures. This approach of applying accountancy allocations to locations and the disproportionate focus on insurable gross margin isn’t representative of the physical flow of products through the supply chain. Inherent mitigations such as alternative sources and strategic stock are excluded from the traditional BI calculations having a massive impact on the operational relevance of the loss estimates.

The future needs to embrace a universal approach to supply chain BI and CBI quantification that relies on information that already exists within the business. No one within a complex organization is going to create information purely for insurance or risk management purposes. The supply chain risk manager needs to draw on information that is used for business planning decisions; profitability predictions, physical flows of manufacturing routes, alternative capacity, strategic stock, all need to be built into the supply chain risk exposure quantification.

Systematic approach to Supply Chain Risk Management

An appropriate method of quantifying the value at risk at critical supply points is important, but it is just one part of a multi-step approach to strong Supply Chain Risk Management (SCRM). The six key steps are depicted below:

Figure 3: Steps to strong Supply Chain Risk Management



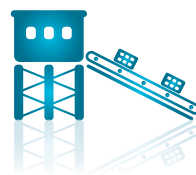
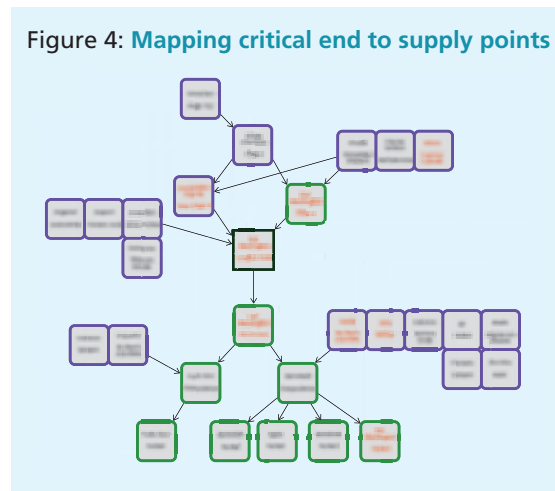
The overriding principle of this approach is that it should become a sustainable business process. Sustainability can be achieved by adopting a risk-based approach, by:

- Focussing on the most value adding supply chains and tapping into business data that already exists, across a variety of departments.
- Reducing a huge supplier base to a manageable number of suppliers by applying criteria such as single points of failure, uniqueness of component, control of key intellectual property, etc.
- Starting the process with internal manufacturing sites and Tier 1 suppliers and gradually moving deeper up the supply chain where vulnerabilities are revealed.

CRITICAL SUPPLY POINT MAPPING

Once it is clear which value streams justify detailed analysis, then structural data for their key supply chain dependencies can be collated. This structural supply chain data can be broken into two categories; data that is specific to the value stream (such as Gross Profit Predictions) plus location specific data which describes the critical supply points (such as unique location identifiers and alternative sources).

Figure 4: Mapping critical end to supply points



OVERLAYING MAJOR THREATS

Once this structural data is in place and the critical supply points for high value supply chains are mapped out, the really interesting work can start from an insurance perspective, namely the overlaying of different threats or scenarios. The ultimate aim is to estimate the impact of different threats on the supply chain structures.

The threats that are selected for modelling should apply to the majority of critical supply points. Fire is normally the starting point as it is a major threat to all locations. The selection of other threats for modelling will depend on a number of factors, including:

Supply chain design

If the organization is highly outsourced, it would be important to understand the impact of supplier insolvency on the business. If the company is highly internalized, with many owned manufacturing dependencies, it would be more relevant to model critical machinery failure.

Geographical locations versus natural hazards and political unrest

If there are concentrations of critical suppliers in certain areas then, by building a consolidated report of the impact of a known regional hazard on profitability, further detailed natural hazard studies can be justified.

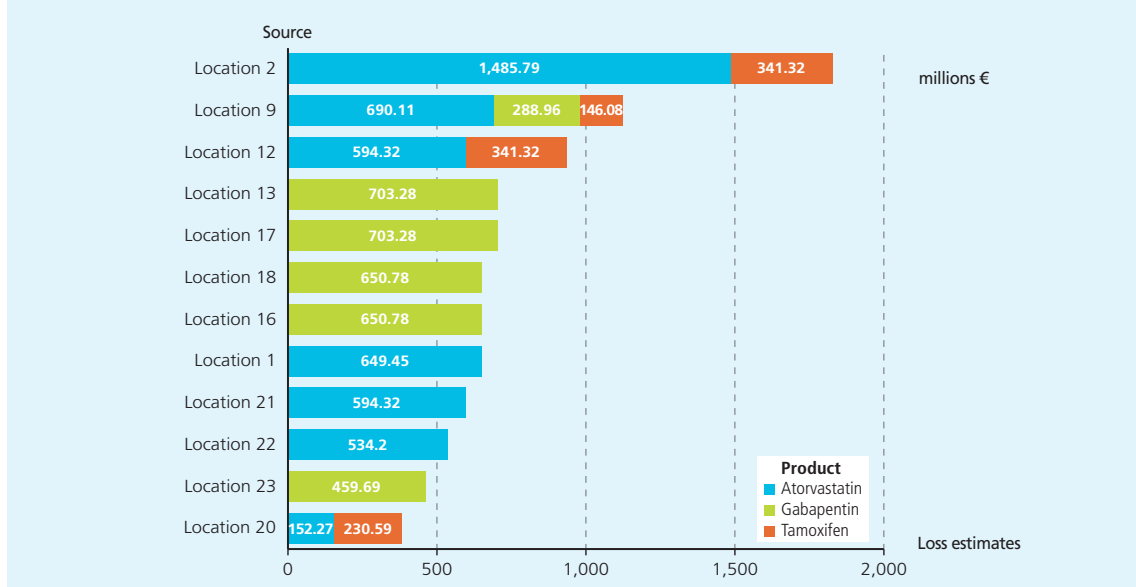
Figure 5: Example of India



PRIORITIZED LIST OF LOCATIONS

The impact of the threat on each critical location across all value streams (portfolio of products) can then be tracked and used to build an interdependency picture which prioritizes the critical supply locations for action, as shown in the example below.

Figure 6: External source losses per product



JUSTIFIED MITIGATIONS

Once a “value at risk” is assigned to each location for key threats, the most important stage of the process can begin – justifying investment in mitigation actions such as:

- Establishing and validating alternative suppliers
- Capital investment in critical plant or spares
- Holding appropriate levels of strategic stock
- Bringing critical activities back in house.

MONITORING CRITICAL EXPOSURES

Having built up a detailed picture of critical supply points, and taken steps to reduce key exposures, the final step is to monitor the status of those locations. Referring back to the KPMG report, only 9% of the respondents said they could assess the impact of disruptions within a matter of hours. The 9% have a competitive advantage by being able to respond quickly to failures in their supply chain. However, in our data rich world, there are many information feeds available which can help supply chain managers to stay on top of the status of critical supply points. Some data, such as natural hazard alerts, can be obtained free, others such as political security risk warnings and financial health status alerts, might require subscription.

This brings us to the conclusion of the SCRM lifecycle but, as with any good practice, once completed for the first time, the cycle starts again, this time digging further up the tiers of critical supply routes, and refining the data based on the ever changing supply chain landscape.

HOW DOES STRONG SUPPLY CHAIN RISK MANAGEMENT HELP INSURANCE BUYING?

From the insurer’s perspective, there is increased confidence that operational mitigations have been applied where possible and only residual risk is being transferred. There is also greater confidence that actual exposures are reported rather than pure Gross Profits and consequently the ability to track aggregations is vastly improved.

Strong SCRM reassures the Insured of optimum insurance buying decisions i.e. the right cover is being purchased at the right attachment point and limit. Also, there is the additional advantage of enabling the purchase of non-traditional perils that are available today within certain sectors of the insurance industry. Having used this quantification method, non-damage cover becomes much more straightforward to secure.

In summary there is a strong case for quantified Supply Chain Risk Management from an operational risk mitigation perspective and for the purpose of optimized insurance buying. The tools are available now, but the business process needs to be sponsored at a senior level and insurers need to be requesting more representative BI data from their clients.

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3

BUSINESS INTERRUPTION AND CONTINGENT BUSINESS INTERRUPTION: ORIGINS AND DEVELOPMENT

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Not new concepts but growing interest

BI (Business Interruption) and CBI (Contingent Business Interruption) are extremely old concepts. The first record of them dates from between 9,000 and 3,000 BC, coinciding with the appearance of agriculture and writing respectively. They brought with them the concepts of suppliers and customers, low and high seasons and shortages in supplies due to adverse conditions.

Throughout history, business has grown in size in proportion to the inventions of the age. The industrial revolution in the 19th century was followed by mechanization, Darwin's theory of evolution, and genetic knowledge through the work of Mendel. The development of the steel industry, electricity, transportation, mechanization and automation all had a significant impact on how people lived their lives. In the early 1920's there were approximately 1.6 billion people in the world, compared to 6.5 billion people (consumers) now. In the middle of the Second World War, one of the darkest periods in our relatively recent history, radar was invented. Radar technology uses microwave radiation, microwaves are used for data storage and data transfers, and this has led to the computers we all use today. In the 1960's, the space race introduced satellites and the era of communication, followed by the era of globalization from 1980-2000.

In the 1980's, business was boosted by what we will refer to as a "ZOOG" cocktail (Zero stock, Optimization, Outsourcing, Globalization), a kind of energy drink for industry with both health benefits and side effects.

Zero stock means just that – raw materials, work in progress material, packaging material, finished products and spare parts are no longer stored at the plant. Orders are completed "Just in Time" (JIT) in order to reduce costs.

Optimization is achieved in a number of ways. For example, instead of having several processing lines in one plant there is just one, which is far more cost efficient. Automation provides a higher level of efficiency while concentration centralizes the production process, with just one plant producing one product instead of several plants in the past. Other ways in which business can be optimized are vertical integration (vertical integration of some of your suppliers and customers in your own business and horizontal integration of competitors for the same range of products) and symbiosis (customers and providers located in the same complex sharing each other's utilities and work in progress materials).

The **Outsourcing** of non-core and core business is designed to improve efficiency and consequently to reduce production costs.



Warehouse

Globalization is all about the fungibility of goods and assets around the world, moving away from past multi-national business models towards modern, highly specialized multi-regional business models.

The ZOOG cocktail would be a perfect concept in an ideal world. In the real world, however, if something goes wrong, such as a shift in the market or a blow to operating conditions, the impact can

spread far and wide very quickly. In a world where trade involves interactions with several different parties – customers, suppliers, retailers, distributors, e-markets, logistic partners, manufacturers – this makes doing business more fragile than ever. Any shortage of critical material results in supply chain interruption and process shut down, leading to Contingent Business Interruption – CBI – from an insurance standpoint.

Understanding the concepts

The term “supply chain” is a logistics term covering suppliers, customers and after sales services, i.e. any kind of service that enables an organization to sell products (e.g. delivery systems, warranties, helpline support, service packages, repairs, exchanges, financing solutions, etc.).

The term “Contingent Business Interruption” – CBI – is an insurance term that basically mirrors the supply chain. In CBI terms, a supplier becomes a “contributing property”, a customer is a “recipient property” and after sales service is referred to as “leader property” or “dependent property”.

Supply Chain (logistic view)	Contingent Business Interruption (insurance view)
Supplier (Material, equipment, services)	Contributing Property (Contributing supplier or contributing manufacturer)
Customer (Goods)	Recipient Property (Finished products)
After sales services (Delivery, warranty, withdraw, returns, hot line, support / services package, repair, exchange, alternative solution, e-user manual financing, etc.)	Leader Property (Attracting customer)

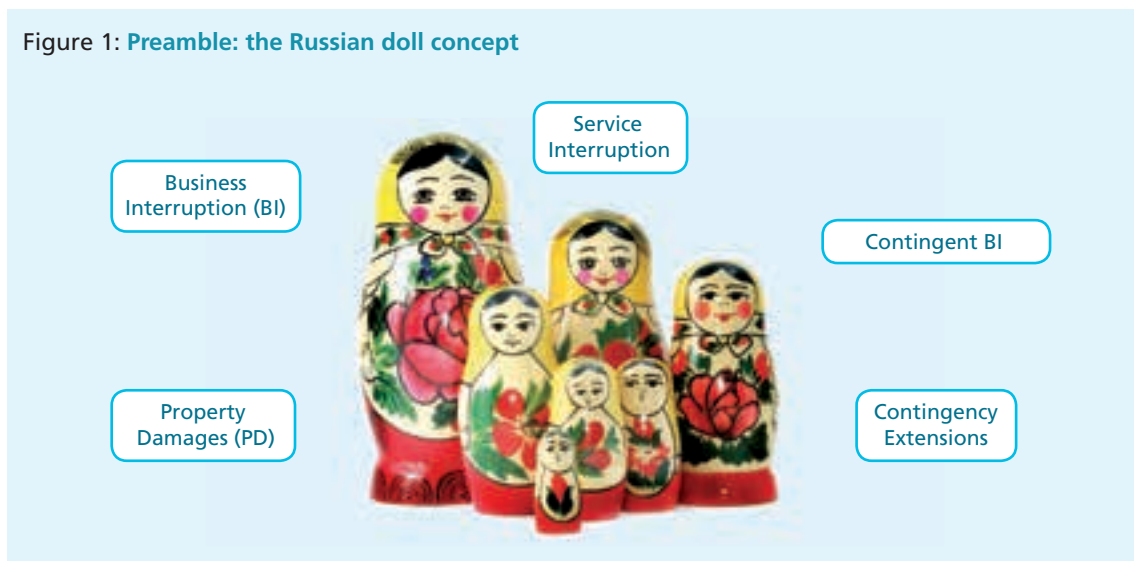
CBI insurance is also known in the UK as contingent extra expense coverage (loss of profit and extra expenses). In the U.S., the term “contingent time element” – CTE – is used instead of CBI and includes several differences. Other parts of the world use the terms “contingent business income”, “dependent properties insurance” and also “waiting hours insurance”.

The loss of a supplier (logistic view) or contributing property (insurance view) constitutes as far as today the major exposure compared to the loss of any other dependent property (customer # recipient property or after sales services # leader property).

Of course this statement may change in the nearest future depending on further potential developments of business models.

Induced BI is often confused with CBI. Induced BI results exclusively from an interruption to the supply chain within an organization (e.g. plant A supplying plant B within the same group). The business links between the entities within a single organization are called interdependencies from an insurance standpoint. CBI is an interruption of the supply chain due to an event that occurs outside an organization, and which affects a supplier, customer or other dependent property.

Figure 1: Preamble: the Russian doll concept



Considering the above, the most obvious difference between a CBI claim and a BI claim resides in the fact that, as far as CBI is concerned, the insured is not dealing with damage to its own facility, but damage to a third party, supplier or customer (outside the organization).

Typically, CBI and BI triggers are determined by property damage (PD) coverage triggers. Everything is linked. In fact, it would be nonsense to speak about CBI or BI separately because BI is an extension of property damage and CBI is an extension of BI. Coverage for service interruption (utilities) and other contingency extensions are also extensions of BI. This is very similar to the Russian doll concept as shown in Figure 1.

In order for CBI coverage to apply to a loss, the event and the type of physical damage involved must be insured under the company's insurance policy. For example: an organization is located in Paris, while its main supplier is located in Indonesia in an area subject to tsunamis. The organization clearly does not need tsunami coverage for its own assets in Paris. However,

if it does not have this tsunami coverage in its policy and its main supplier in Indonesia is shut down because of a tsunami, the CBI protection will not be triggered.

Typically, CBI insurance does not cover utility service interruptions, civil or military authority interruptions, lack of ingress or egress interruptions, interdependencies inside an organization or losses caused by a change in temperature, due to damage to heating or cooling equipment. These are currently the main exclusions for CBI.

Moreover, the governing sub-limits usually also govern the CBI limits.

Business Interruption and Contingent Business Interruption are often misunderstood, due to the fear of the unknown (too many parties involved) and time constraints (serious investigations needed to assess both exposures). Moreover, there are language and cultural issues involved, which mean that we do not share the same understanding of these concepts around the world.

BI and CBI insurance is not a nice to have standard coverage, it corresponds to a specific need. BI and CBI insurance coverage shall apply to well identified and carefully assessed residual risks only. BI and CBI insurance shall not apply to unknown risks which are transferred to the insurance market as such. A risk becomes residual when all prevention and protection measures have been taken in order to mitigate any potential losses. Moreover, since no organization is the same, there is no “one size fits all” BI and CBI insurance

coverage. It has to be specifically tailored to a given residual risk. At the end of the day, it's all about risk management.

BI and CBI are very sophisticated products, and as such appear to be far more suited to mature markets. Nevertheless, highly sophisticated BI and CBI products are currently sold in emerging countries and the concepts behind them are generally neither fully explained nor fully understood.

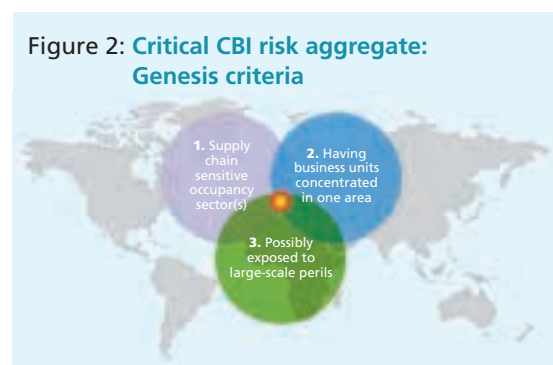
Current threats

The Thai floods, like the Japanese earthquake in 2011, acted as a wake-up call in terms of CBI exposure. However there had already been several warnings in the past: the Taiwan earthquake in 1999, Toyota in Japan in 1997, Philips in the U.S. in 2000, the World Trade Center in 2001, Australia Apache Gas in 2008.

CBI exposure is higher today due to a global economy with global interactions. Any large-scale event creates an opportunity for large-scale BI, and especially CBI, loss aggregates.

The genesis criteria for critical aggregate CBI risk are as follows:

- Occupancy sectors that are highly sensitive to supply chain disruptions. (Assembly processing sectors such as electronics and the automobile industry rely on numerous suppliers and are more sensitive than manufacturing/production sectors – i.e. heavy industry such as steel).
- Business units for the occupancy sectors mentioned above concentrated in one geographical area (the so-called regional concentrator).
- Exposure of these geographical areas to large-scale perils.



Reinsurers are exponentially more exposed to this risk than any ceding insurer. To control such multiple exposures, in an ideal world it would be fundamental to have each supplier named in the policy, including supplier extensions. However, since this is not always possible, a sub-limit for the extended coverage for suppliers at least provides a mitigating element.

Conclusions

To conclude, in order to be able to provide adequate risk financing solutions for CBI exposures, (re)insurers and insureds need to make a joint effort:

- Industries and risk managers need to secure the supply chain. They need to identify and understand the impact of other businesses on the operations of their organization. They need to know their suppliers and they need to assess the coverage required before transferring the residual risk to the (re)insurer.

- At the level of (re)insurance we need to be able to identify the aggregate and to control our accumulations, working closely with our ceding companies. We therefore need to develop new tools in order to provide the right products for our clients. We also need to develop a CBI pricing tool in order to justify our pricing according to the exposure involved.

4

RESILIENCE OF THE BUSINESS MODEL OF TWO KEY INDUSTRIES: THE ONSHORE ENERGY INDUSTRY

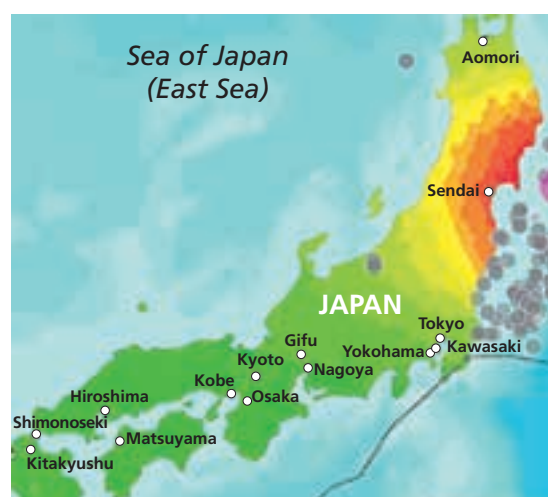
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Recent natural disasters also affected the onshore energy sector

The 2011 Japanese earthquake and Thailand floods disrupted many supply chains of industrial companies around the world. We all read about the catastrophic indirect consequences of the damage caused to automobile or electronics manufacturers; however oil & gas companies were also affected, albeit on a smaller scale. The magnitude of the losses was a surprise – some of the companies were affected despite being prepared and having contingency plans. The extent of the disruption showed how highly interconnected manufacturing chains are today, and how manufacturers often remain vulnerable when they depend on single sources of supply.

In Japan, a major global petrochemical company had one manufacturing location. It had dozens of customers that were directly affected by the earthquake. Tier 2 customers and suppliers were also affected. At that time, Tier 2 customers and suppliers were covered. Nowadays, however, Tier 2 customers and suppliers would not be covered in the onshore energy market. The point here is that it was very difficult to assess this claim because there were so many customer locations affected by the earthquake. This is one of the issues of Contingent Business Interruption (CBI), i.e. the difficulty of adjusting losses due to the difficulty of obtaining

information from third parties, especially when they are so numerous. Both 2011 natural disasters revealed wider interdependencies than previously thought, along with an increasingly networked global economy, and companies striving to increase efficiency at the expense of redundancy of supply. Hurricanes Katrina and Rita in 2005 had already provided us with examples of CBI losses in the oil & gas sector following natural disasters.



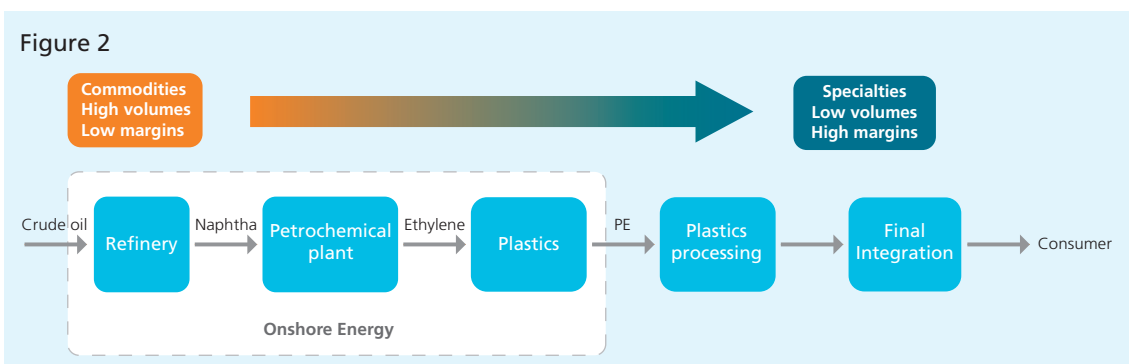
Scope of onshore energy

Before studying some typical examples of onshore energy CBI losses, and in order to provide some context, SCOR's definition of onshore energy covers the processing, storage and transportation of oil and

gas. This mainly involves refineries and petrochemical plants, the two main occupancies, but also involves gas processing plants, gas liquefaction plants, tank farms, pipelines, as well as chemical and fertilizer plants.



Specifics of onshore energy risks

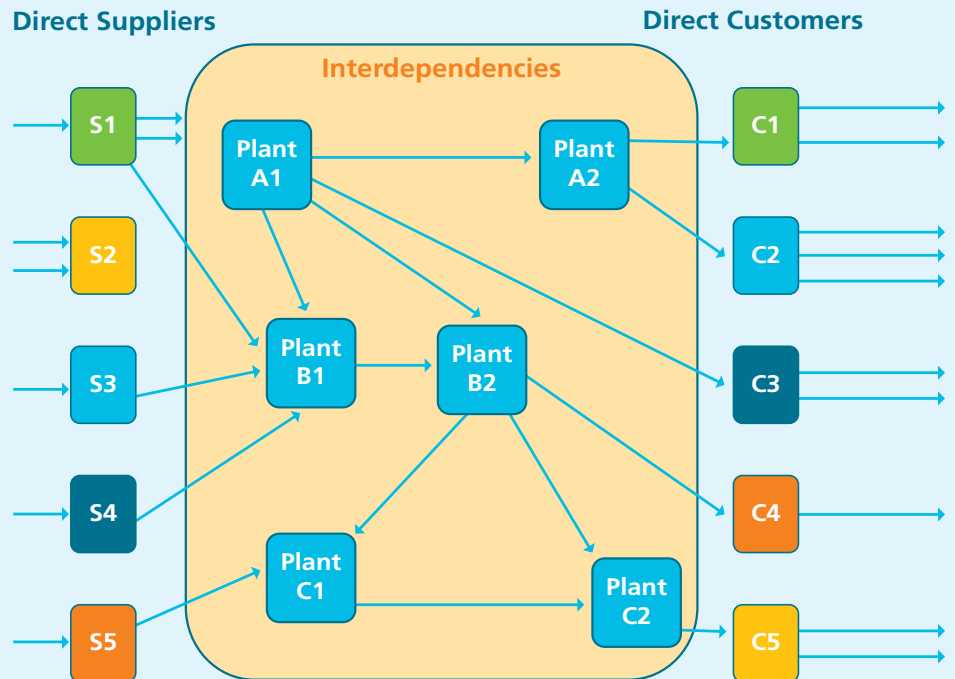


The flow diagram in Figure 2 shows a typical succession of interdependent plants, and will help us to define the specifics of onshore energy that are relevant to supply chain management. First of all, the feedstocks and products are mostly commodities, and alternative sources are generally possible at extra expense, subject to the availability of existing infrastructures to bring these alternative sources and alternative feed stocks to the plant. As indicated, the starting point is the processing of crude oil in a refinery. There are numerous sources of crude oil and lots of alternative sources, so losses can be mitigated. The problem resides in how to take this crude oil to the refineries, which can be an issue, as will be seen later in the examples of losses. For a refinery, the feedstocks and the products are commodities. They are high volume and low margin compared to more downstream plants, where products are low volume, high margin specialties. What we are interested in here is onshore energy, as

defined above on the left hand side of the diagram. This implies commodities with high volumes, although some plastics or fine chemicals tend to be more like specialties. Transportation by pipeline is common for liquids and gases. The processing of large volumes of hydrocarbon liquids and gases is dangerous and there is a high risk of explosion and fire. As a result, accidents in the oil & gas industry can be deadly, sometimes killing many employees. In 2012 an explosion in a refinery in Venezuela killed 45 people. Another explosion in a gas plant in Mexico killed 26 people the same year. In 2013 an explosion in a petrochemical plant in the US killed 3 people, delaying full access to the site by several months, which has implications for the period of interruption. Finally the processing and transporting of large volumes of liquids poses high pollution risks, which can lead the authorities to interrupt industrial operations in case of loss.

Onshore energy flow charts can be complex

Figure 3

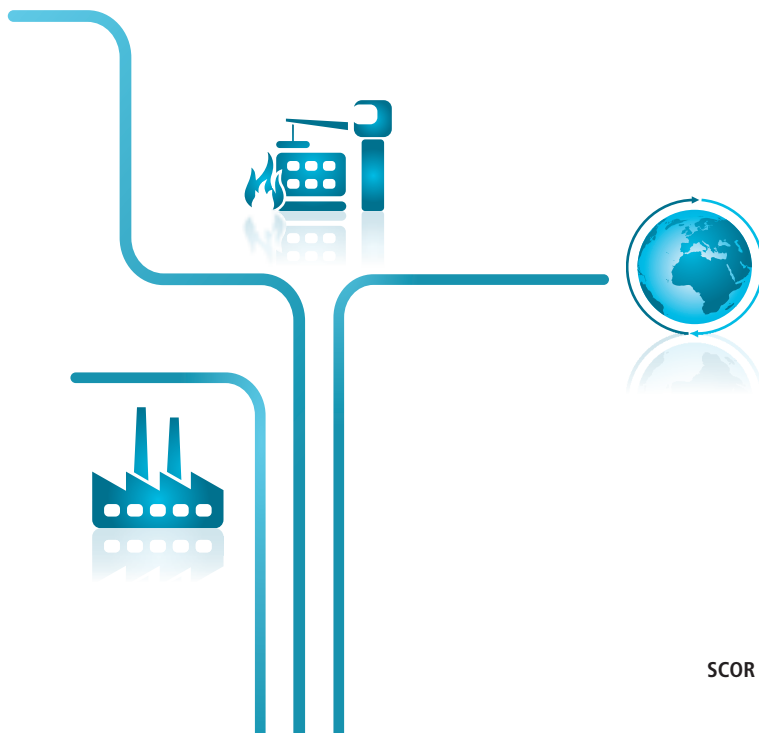
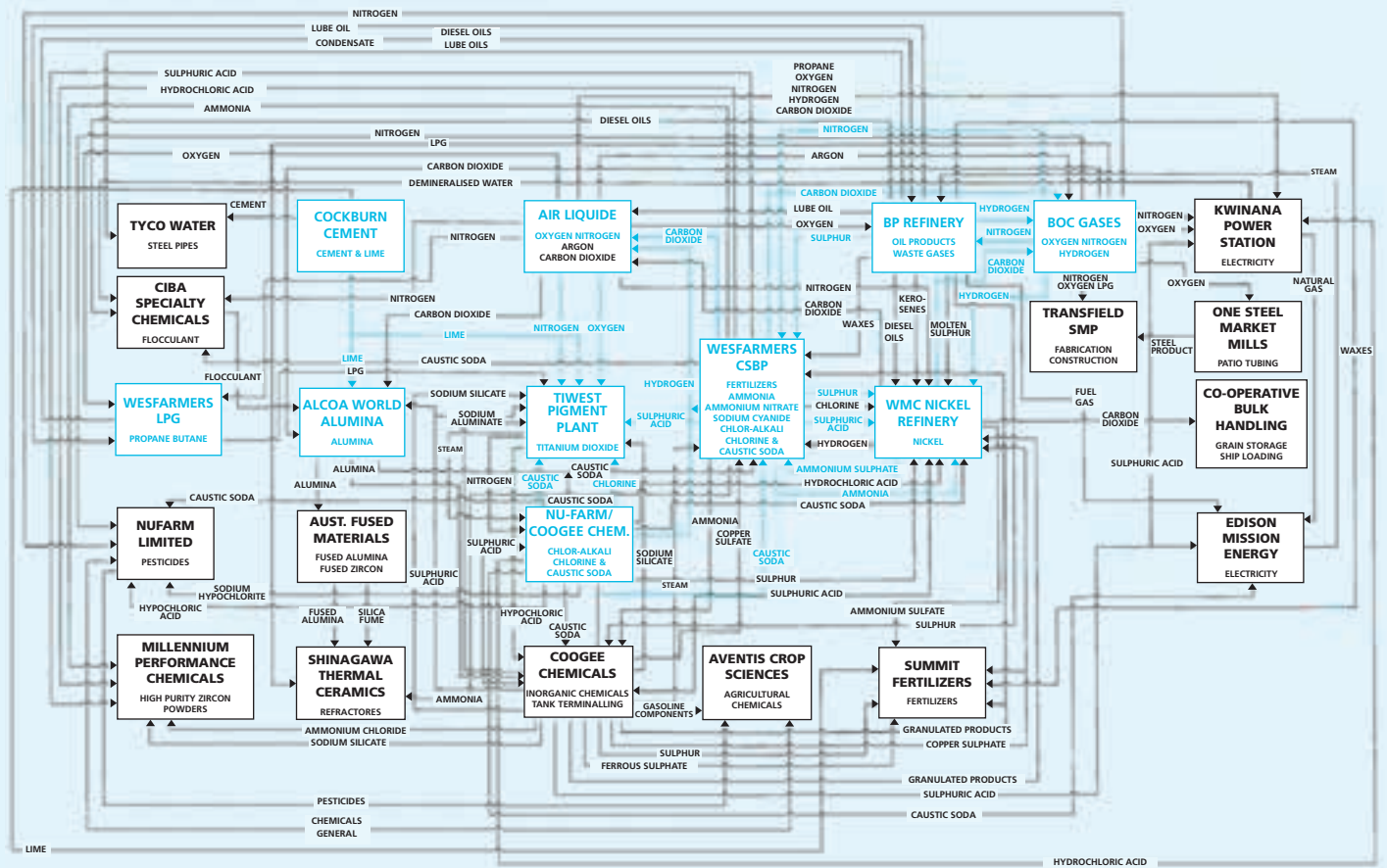


As shown above in Figure 3, flow charts can be very complex, particularly for onshore energy companies, there are often heavy interdependencies between several plants. The flow chart shown in Figure 4 is a real one, and shows the complexity of supply chains. These charts are necessary if one wants to understand the possible accumulations and exposures involved in CBI coverage. In this

example there is a refinery in the middle which is also interlinked with many other companies from the oil & gas sector, including some fertilizer plants.

The real life examples of man-made disasters set out on the next page show that these can also cause major economic losses to oil & gas suppliers and customers.

Figure 4: Example of complex flow chart



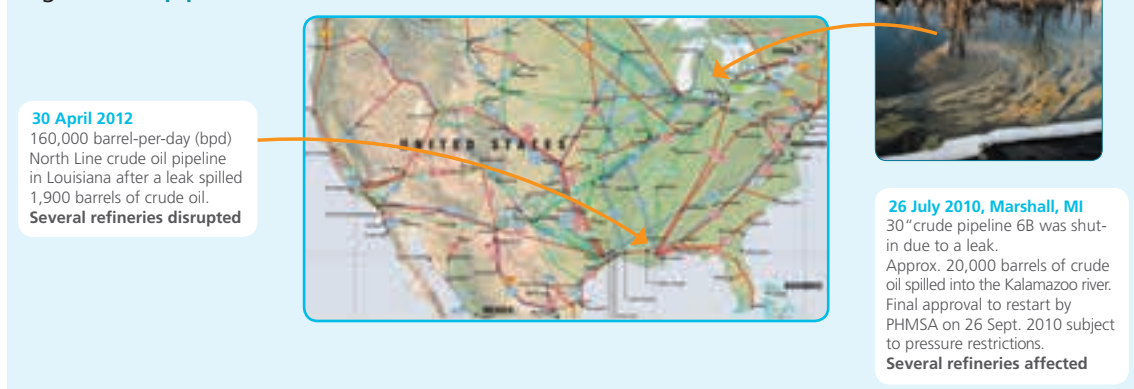
CBI losses due to crude pipeline failures



In 2009, a 40-inch crude oil pipeline failed in the South of France, causing a huge spill of 4,000 m³ (as can be seen in the picture in Figure 5) and major pollution in a natural reserve. The authorities allowed the pipeline to restart in January 2010, about six months after the event and subject to pipeline operating pressure restrictions. Normally it would take a few weeks to repair a pipe of that size, but because of the pollution and the authorities' investigations, it actually took six months, so it became a catastrophic event. The cause was established to be gradual corrosion which was a coverage exclusion, and therefore it was excluded as a CBI loss for the refineries that were affected downstream. This is an example of coverage gap.

As can be seen on the map in Figure 5, two refineries were directly affected because they relied on that single pipe, and they were affected for several months. After a few months they implemented some mitigation measures, but overall they suffered major losses. Conversely, the MIRO refinery in Germany had two pipelines feeding it, and therefore suffered no losses at all as it had an alternative source of supply, which is a typical mitigation measure used to reduce CBI exposures. Looking at the European map of pipelines and refineries, one can easily find other examples, especially inland, of refineries that are very vulnerable to such losses. This loss was catastrophic but it is not uncommon, and one can find other recent examples in the United States.

Figure 6: US pipeline networks



The map above shows the US network of major pipelines. In 2010 there was an accident involving a 30-inch crude pipeline. The scenario was similar to the previous example, i.e. the pipe was corroded and there was a leak. It took two months to repair this and to obtain the authorisation to restart the pipe. Approximately 20,000

barrels of crude oil spilled into the Kalamazoo River and several refineries were affected. Again in 2012, there was a similar scenario in Louisiana, with 1,900 barrels spilled. It was a 160,000 barrel per day crude oil pipeline and we know that five or six companies were affected, including SCOR clients, which generated CBI losses.

Varanus Island explosion, 2008

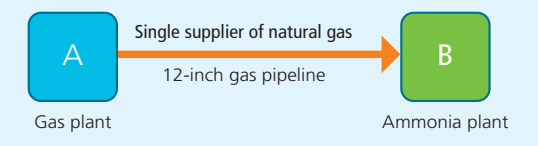
Figure 7



The well-known Varanus Island explosion that occurred in 2008 was another type of scenario. There was a major disruption to the Western Australian economy, which lost one third of its gas supply following the explosion of a 12-inch gas pipeline located near a gas plant located on Varanus Island. Many companies were affected, especially in the mining and power sectors, all the way down to southwest Australia. We are specifically interested here in Company B (see Figure 7) operating in the onshore energy sector.

This interrupted the gas supply to plant B which had to shut down. The National Offshore Petroleum Safety Authority of Australia (NOPSA) made a thorough assessment of the loss and established that the pipeline had not been maintained properly. That would have been difficult for underwriters to know unless they underwrote company A, and this is another difficulty in terms of the underwriting of CBI. One can have an idea of the flow charts, but it is difficult to assess the quality of the third party risks. In this case, company B had a very specific contract and was as a result, as far as we know, one of the last ones supplied gas. It took 7 months for Company B to get back to 100% production. Again, it was very difficult for loss adjusters to get the full information concerning company A. It was a major CBI loss for company B and one of the biggest CBI losses for onshore underwriters. It was also a potential major accumulation for insurers covering the other mining and power risks that were affected. Again, it would be fairly easy to find similar catastrophic scenarios.

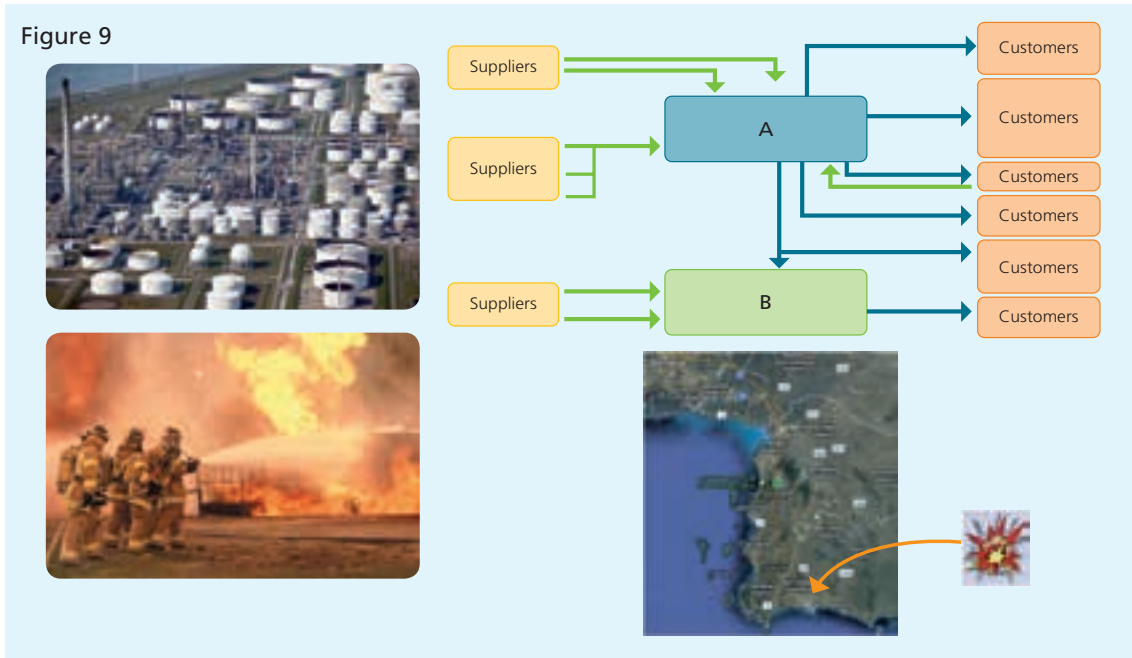
Figure 8



As a flow chart, this case is very simple (see Figure 8). The gas plant had one single pipeline going to plant B. The pipe exploded due to a leak, which was itself caused by corrosion.

Explosion in a petrochemical plant, Thailand, 2012

Figure 9

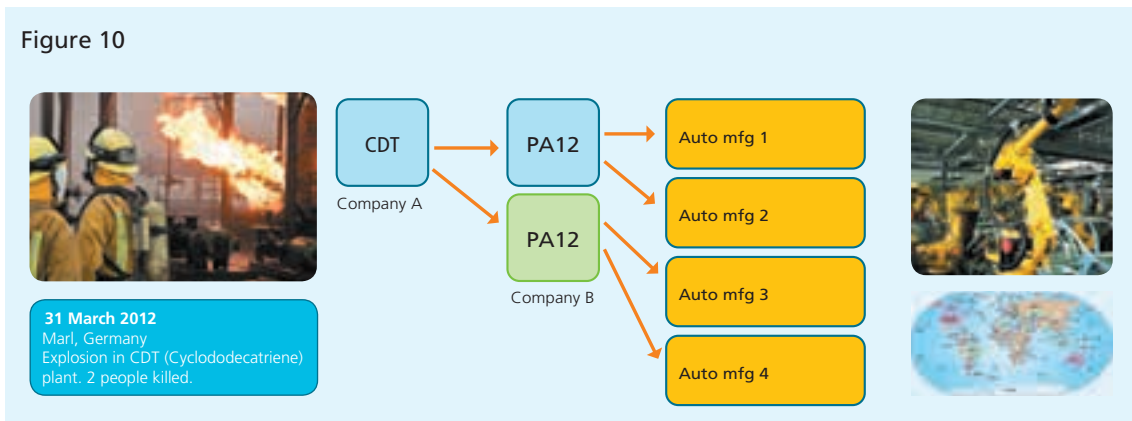


An explosion at a petrochemical plant in Thailand in 2012 unfortunately killed 12 people. It happened in Map Ta Phut, which is a huge petrochemical complex with many dependencies and interdependencies. Several C4 hydrocarbon customers were affected, as can be seen above (Figure 9). There were a number of customers and suppliers, and therefore the loss on A and B was potentially going to affect all of the suppliers and customers, possibly generating an accumulation of losses. Actually in this case, because the products were commodities, customers were

able to find alternative sources, but they incurred extra expenses. One of the customers had to build a short pipeline to be able to export some products. Shutdown and restart costs were involved at one of the plants. This scenario is a bit more complex, but ultimately it was not a catastrophic CBI loss. Nevertheless, one could imagine similar scenarios in more complicated flow charts that would generate catastrophic losses. The fact that many people died also slowed down the process and lengthened the interruption.

Explosion in a chemical plant, Germany, 2012

Figure 10



This explosion in a petrochemical plant in Germany in 2012 (company A in Figure 10) is another interesting, well-known case – two people were killed and it

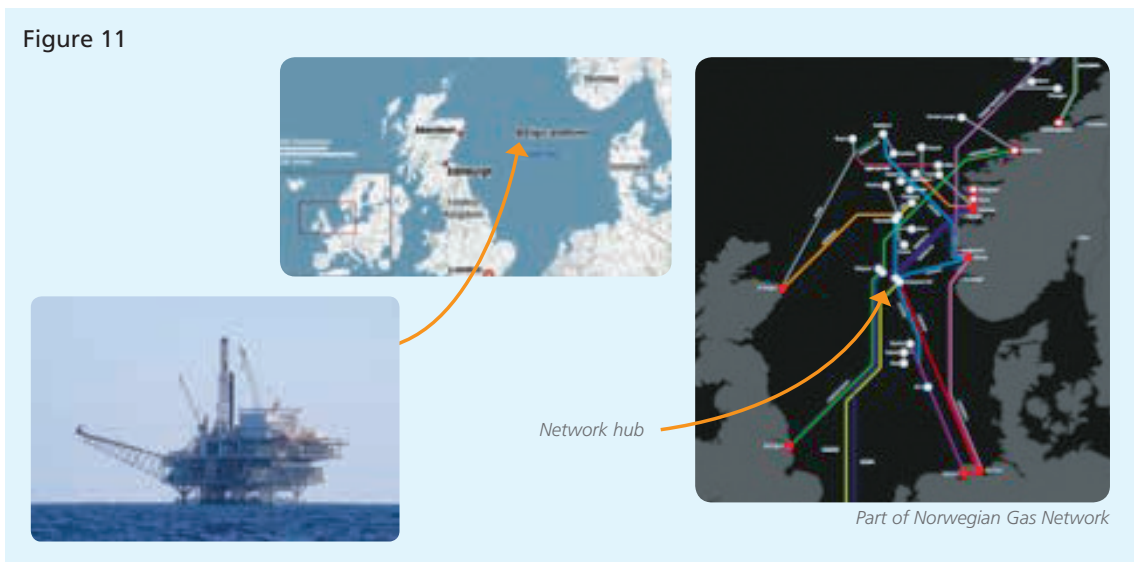
caused major disruptions. This plant manufactured highly specialized products.

CDT is a key component in the manufacturing of PA-12 Nylon resin, which is specifically used by many automobile manufacturers. It is the sole specified material used to make automotive fuel and break lines due to its unique combination of thermal, physical, chemical and mechanical properties. So when the event happened, there was a big panic amongst many automobile manufacturers. We do not know the precise extent of the losses to automobile manufacturers. We know there were some losses, but we don't have any details. They did manage to find alternatives for this critical component, however this took some time. Automobile manufacturers were not fully prepared for this kind of loss. They had not

thought about possible alternatives before the loss. The Automotive Industry Action Group (AIAG) worked long and hard to test alternatives and ultimately managed to find partial alternatives. There was also a major loss to company B (Figure 10), which used CDT to manufacture PA12, as there were no alternative sources. The German plant of company A produced more than 50% of CDT worldwide. The downtime was estimated at 9 months, leading to a very tight supply of CDT. This was a classic bottleneck situation, the kind that underwriters would like to see identified when they are accepting a big CBI sub-limit. Again, this involved a potential major accumulation of losses for underwriters.

Elgin gas leak, North Sea, 2012

Figure 11



The Elgin platform gas leak happened in the North Sea in 2012. It was stopped after two months. As far as we know, only one refinery was affected, and only slightly. As mentioned previously, it is hard to find the information if one is not insuring the client affected. The disruption was minimal, however there

was a major risk of explosion, which could well have happened. The consequences from a supply chain point of view probably would not have been enormous, but if such a scenario happened near an offshore hub, (see Figure 11 flow chart), this could have caused a major disruption.



Risk managers' view vs. underwriters' view

The 2011 natural catastrophe losses prompted new interest in supply chain disruptions from top management. From several surveys and contacts with risk managers, it is obvious that the risk management of supply chains is increasingly at the top of the list of risk managers' concerns in all sectors, including onshore energy. This was confirmed by a Willis Energy survey in 2012.



On the underwriting side, there has been huge interest in the topic since 2011, in the form of brokers' and lawyers' seminars, publications, market studies, and so on. The main challenge for underwriters is how to deal with the lack of information, the uncertainty of exposures and the difficulty of managing accumulations. Consequently, onshore energy underwriters have been restricting coverage and asking for more information.

The Lloyd's Market Association questionnaire (LMA9020) is a market initiative arising from the 2011 losses and testimony to the strong desire to find solutions that will help clients and underwriters to understand CBI exposures. We need to control these exposures – we have already seen examples where we could have had catastrophic accumulations following both natural catastrophe and man-made events. There is also the difficulty of adjusting CBI claims, as previously mentioned. These losses are very complex to analyze, even when you do have some information.

Onshore energy and other property underwriters generally exclude non-damage, epidemic, strike, offshore, corrosion, war, political risks, cyber-attacks, indirect suppliers and customers. Therefore there has always been a coverage gap, but it has been increasing as risk managers have sought more and more cover, while the market has generally not been able to respond.



Type of information (incremental)	Quality	Frequency	Underwriter use
Names of direct suppliers	Very Basic	Frequent	Guess potential accumulation
Critical direct suppliers	Basic	Frequent	
Critical direct suppliers per insured location	Basic	Frequent	
As above with names of products	Better than std	Frequent	Estimate criticality
As above with locations of suppliers (Cat)	Better than std	Fairly Rare	Worst case accumulation assessment
As above with flow diagrams with volumes	Good	Fairly Rare	More quantitative assessment
As above with flow diagrams with Earnings/Profits	Good	Rare	
As above with critical points/alternatives	Good	Rare	
CBI studies with critical points*	Best practice	Rare	
Full up to date BCP (Business Continuity Plan)**	Ideal	Very Rare	Full risk & accumulation assessment

* incl. mitigation, alternative sources, scenarios with EMLs

** incl. alternative contracts, mitigation plans, alternative sources and products, non-damage scenarios, Tier 2, extra expenses, time scales

The table above maps what underwriters actually see in terms of information against what they ideally need in order to underwrite properly. As indicated at the bottom of the table, underwriters would ideally like detailed CBI studies with critical points, good flow charts showing profits, products and locations of the suppliers and customers, alternative sources, and so on. These are still rare, although more and more onshore energy companies have been asking consultants to map

their exposures. In practice, onshore underwriters too often only receive limited information, e.g. the names of suppliers and customers, and sometimes of critical direct suppliers, but this is not enough to be able to underwrite properly. As pointed out above, even with good information about the exposures, it is still difficult to get an idea of the risk management practices of third parties and of the probability of sustaining a loss from a third party, without having that company as a client.

Conclusions

The onshore energy sector has specific supply chain issues. As described in the examples provided, supply chain management is a key issue in the onshore energy sector as well as in other sectors. Insurance is only part of the solution. Insurers and reinsurers need more information from clients in order to control their CBI accumulations. To bridge the information gap, insurers,

brokers and risk managers need to work together to find ways in which to map all the risks and find the right compromise between risk management and risk transfer. SCOR Business Solutions underwriters work with risk managers, brokers and their engineers, so that they can respond more effectively together to the underwriting challenges posed by CBI and interdependencies.

5

RESILIENCE OF THE BUSINESS MODEL OF TWO KEY INDUSTRIES: THE AUTOMOTIVE INDUSTRY

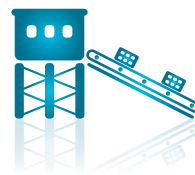
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A brief history of the automotive industry business model and its change of paradigm

The automotive industry is a true **global industry** composed of large, heavily concentrated multinational corporations, with the five largest **Original Equipment Manufacturers (OEMs)** accounting for about 50% of the world's total production of 84 million light vehicles in 2012 (the same is true for the Big Three – GM/Ford/Chrysler – which also account for about 50% of North American production).

This historical consolidation is now changing for the first time, as dozens of new local companies have recently been set up, particularly in emerging countries such as India and China. And by the end of the decade it is anticipated that the automotive market will be much more fragmented. Emerging economies do not constitute the only driver supporting the creation of new companies. New technologies, such as hybrids, hydrogen cells and full electric also play an important role. Recently, smaller niche players such as Tesla and Fisker have been able to start up operations in the very mature, if not saturated, North American market.

The automotive industry is split into two categories: the **Original Equipment Manufacturers (OEMs)** and the **suppliers** (some of them could be considered OEMs as well, but for the sake of argument we will simplify). Although deeply inter-related, these two populations are different in many respects: their financial health, their global reach (or at least their footprint), their operating margins, risk management sophistication, access to capital, and their overall **business model**.





Car production

The “historic” OEMs originated in the first half of the twentieth century, from such industrialized countries as the USA, Germany, France, Italy, Japan and Korea. Once established in their respective markets, they quickly realized the need to consolidate their positions, evolving from a **comparative advantage** to a **competitive advantage**. According to Michael Porter’s theory (as described in his 1985 book: “Competitive Advantage”), states and businesses should pursue policies that create high-quality goods to sell at high prices in the market. Auto makers therefore embraced that theory to outperform their numerous competitors (or simply to survive), and started relying on third party manufacturing (subcontractors) to achieve lower manufacturing costs, better product quality, transfer of responsibility, low stocks and high inventory turnover, mainly through **Just in Time (JIT)**.

The most visible aspects of these changes consisted of implementing **platforms**, **flexible manufacturing**, **increasing R&D** spending, creating **alliances**, taking advantage of **new technologies** and generally streamlining the business model.

The immediate benefits of this new business model consisted of better inventory management, lower

R&D development costs, improved quality control, flexible manufacturing and faster time to market for new products.

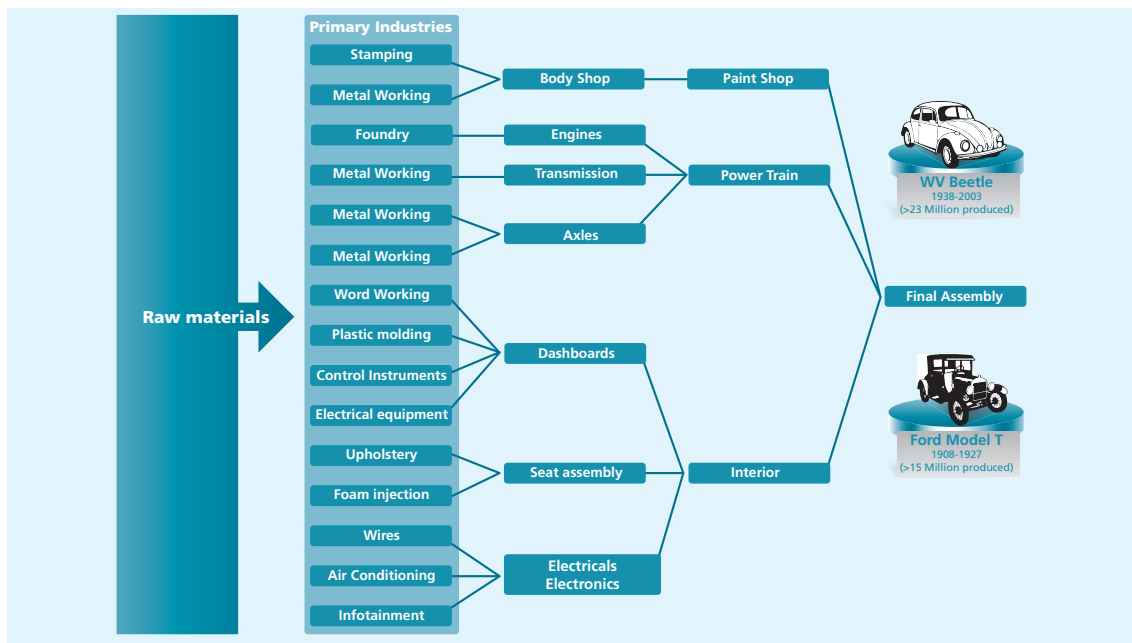
On the other end, platforms increased competition per segment due to less **product differentiation**, less flexibility between platforms, more risk concentration and the transfer of internal **proprietary knowledge** to third party suppliers, who often work with multiple OEMs.

Over time OEM business models evolved from **domestic** to **international** and on to **global**, in search of lower manufacturing costs. They first consolidated their presence in their respective markets of origin, before growing out of their original domestic markets through **exports**, in an effort to reach a global customer base. Next came **expansion**, establishing local production in neighbouring countries to support their respective domestic markets and to benefit from lower manufacturing costs, (i.e. Central Europe for West European OEMs, or Mexico for the US, like Nissan in Mexico). They then moved on to more distant emerging countries, originally to reduce further labour costs, but ultimately to service these growing markets from within through **localization** (such as VW in Brazil, GM in China, etc.).

The automotive supply chain explained

The nature of the automotive industry's **supply chain** greatly differs from most other industries, as it tends to delay and concentrate added value towards the last steps of the production process: the assembly line. Other industries often enjoy an even distribution of added value throughout the various steps of the production process. For instance the

pharmaceutical industry's supply chain model is much more linear. Raw materials and supplies are fed into a three-step production process consisting of active ingredients, formulation and packaging. This linear process enables easy identification of **bottlenecks** and implementation of mitigation actions, such as **dual sourcing**.



Original OEMs, back in the early days of Taylorism, saw the advantages of vertical integration such as economies of scale and total control of their supply chain. Thus OEMs have historically been **vertically integrated**. Ford's example is quite representative of the trends across the entire industry:

"Henry Ford tried stockpiling parts and materials, but found that the inventory costs were too high. The answer, he decided, was total control: owning the whole supply chain. By the 1920's his company ran coal and iron ore mines, timberlands, rubber plantations, a railroad, freighters, sawmills, blast furnaces, a glassworks, and more. Capping it all was a giant factory at River Rouge, Michigan, which built the parts and assembled the cars."

The Economist – Vertical Integration – Moving on up – Is the recession heralding a return to Henry Ford's model? – March 27th 2009

However, in more recent times, slower economy growth (not to mention recessions and oil crises), the use of more complex technology and a more global environment created fierce competition, propelling cost management and economies of scale to the

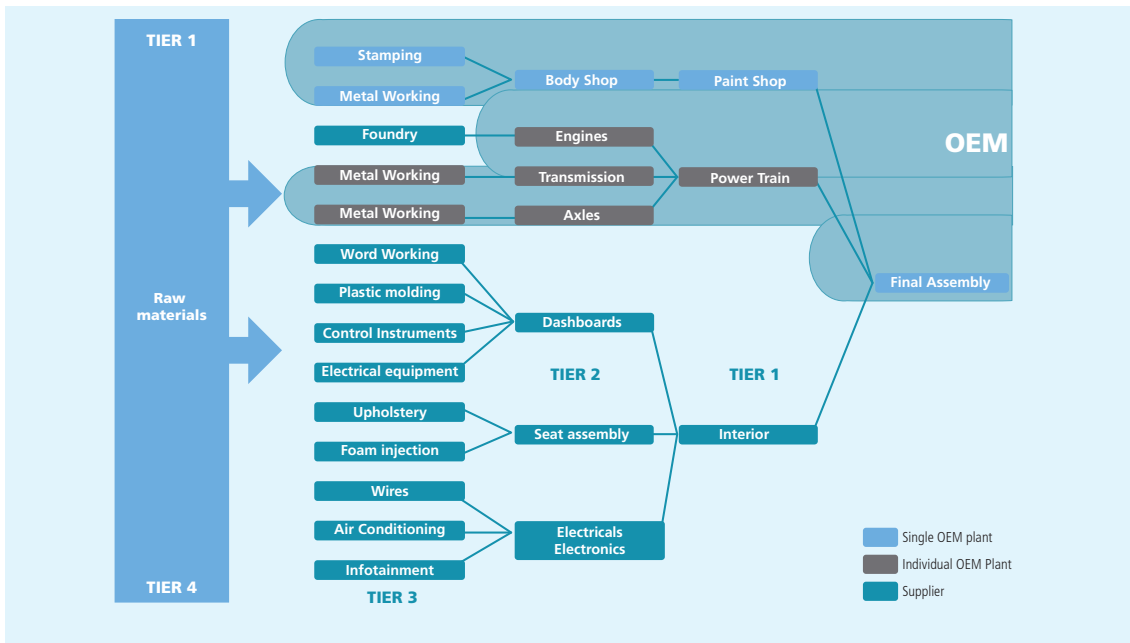
top priorities of OEM strategies and rendering the vertical integration model somewhat obsolete. Thus began the era of "jumbo" suppliers (i.e. Delphi, Bosch, Visteon, Faurecia, Denso, and so on).

This change in paradigm was further affected by Just in Time (JIT) and flexible manufacturing.

The **JIT** philosophy, developed by the automotive industry in an effort to become lean, transferred the responsibility(ies) to the suppliers to deliver quality products in a timely manner and on an ongoing/as necessary basis, directly to the production line. This transfer of responsibility, together with the reduction (and frequent total absence) of Work In Progress stocks (WIP), has increased the dependence of the OEMs on their respective key suppliers. As a result, the income stream of the OEMs became directly dependent on the reliability of their multiple tier suppliers.

OEMs relied on **Tier 1 suppliers**, which in turn were dependent on their own suppliers (**Tier 2**), and so on.

Flexible manufacturing, consisting of securing at least two plants for each platform, each one dedicated to



the production of similar-size vehicles (SUVs, Sedans, Compacts, etc.), has recently been implemented by the most mature companies to offset the bottlenecks created by the original platform manufacturing model, where all vehicles of a similar size were produced at a single location. Platforms (mainly for compact, mid and full size cars) are now being consolidated on a global basis, establishing a competitive advantage for large global players, but at the same time weakening the supply chain by exposing it to more diverse, and harder to control, foreign suppliers, not to mention natural catastrophes.

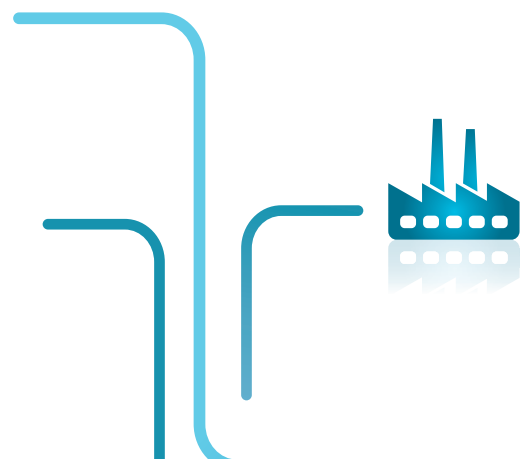
In the 1990's, integrated OEMs (such as GM and Ford) started divesting some key divisions (Delphi and Visteon) in an effort to reduce costs. This did not always turn out to be a success story. Torn between cost reductions imposed by their key customers, the rising cost of material and costly access to capital requiring high leverage, among other external factors, these jumbo suppliers were forced to reduce R&D spending to a minimum, and often to revise their business models, moving away from general product offerings to concentrate on specific products and become niche players.

In more recent years, especially after the 2008 financial crisis, OEMs and suppliers came to realize that the default risk of any one player in the supply chain (the weak link), whether financial, production or quality related, had a far more significant impact on the entire supply chain than originally anticipated. As their mutual benefits became obvious, OEMs and Tier 1 suppliers started working closely together. Some OEMs even contemplated buying back some of their

previously divested divisions (especially critical suppliers with proprietary technology). Others acquired minority shares in some of their critical suppliers in an overall effort to better control their supply chain, expecting to benefit from the stability and efficiency of the vertical integration model, but without the constraints and costs associated with full ownership, granting them more flexibility overall.

Considering the recent trend among OEMs for **associations** (Renault-Nissan), **partnerships** (Chrysler-Fiat), **industrial cooperation** (PSA-FIAT) and **joint ventures** (Ford-Mazda), the industry is as horizontally integrated as it has ever been.

As a result, the automotive industry now operates in a very complex global matrix composed of partners, suppliers and customers.



On losses

In the past, losses at OEMs were spectacular and resulted in large insured claims, often in excess of one hundred million dollars, such as the Ford Cologne warehouse fire in 1977, the Rouge Steel explosion in 1999, the GM tornado in Oklahoma in 2003, various hail storms damaging vehicles located out in the open, and so on.

On the other hand, losses at the supplier level were generally typical of their respective industries (i.e. metalworking, chemicals, plastic materials, rubber, etc.) and with limited impact.

For many years the industry focused on reducing Probable Maximum Losses (PMLs) and Normal Loss Expectancies (NLEs), installing sprinkler protections and independent water supplies, erecting fire walls, using less combustible materials, reducing storage heights of WIP, etc., with the ultimate ambition of reaching Highly Protected Risk (HPR) levels, at least for the most sophisticated ones. In that paradigm, paint booth fires were often considered among the largest loss scenarios, due to their bottleneck situations, which directly impacted the Business Interruption (BI) to the entire plant.

Today, considering the complex environment described above, including JIT, horizontal concentration, reliance on multiple tier suppliers, and so on, the focus has moved from **removing the bottleneck** to identifying the **weak link**. A small incident originating at a supplier can now have rippled effects through any one OEM's entire structure. And should the same supplier be located at a critical place in the supply chain, it now becomes the supply chain's bottleneck, just like the paint booth was to the plant, but with a much more significant impact. The OEM is now subject to an exposure contingent on its own operations. In other words, the supplier's NLE has become the OEM's PML and in some cases the MFL.

This creates a new challenge for both risk managers and underwriters, who now need to understand the entire supply chain, relying on third party data and information, and to identify the supply chain's **weak link**, in order to respectively mitigate their risks and underwrite the risk transfer.

This challenge is further exacerbated by natural catastrophe (Nat Cat) events/perils affecting several OEMs and their respective suppliers in a single event, when located in the same hazard zone.

Managing the supply chain: in search of a competitive advantage

As OEMs rely on many suppliers to complete their final product ("the car"), they are much more concerned by the resilience of their supply chain than the suppliers are of their own operations. Indeed in many instances, the OEMs represent only one of the many clients of any given supplier. This is even truer for suppliers dedicating only part of their production to the automotive industry (i.e. electronic components for automobiles, aerospace, consumer goods/appliances, etc.).

Traditionally in the automotive industry, the Procurement Departments of OEMs have focused on passing on cost reductions to their suppliers while Risk Management Departments have been in charge of mitigation (requesting and managing CAPEX for fire prevention/protection) and risk transfer to the insurance market. This industry-wide practice has weakened the supply chain, over time, to the point where in some instances the very existence of the OEMs has been called into question. This was exemplified during the financial crisis of 2008 when some OEMs had to file for bankruptcy (chapter 11), following in the footsteps of their own suppliers.

The more sophisticated OEMs had already embraced an Enterprise Risk Management (ERM) philosophy, setting up dedicated supply chain departments. Other less sophisticated OEMs and suppliers followed up only after sustaining a large loss, which usually also resulted in loss of market shares, constituting a wakeup call to senior management.

The supply chain is subject to external threats such as Nat Cat risks (EQ, flood, wind, tornadoes, etc.), political uncertainty (change of regimes, nationalizations, Strike Riots Civil Commotions (SRCC), closing of borders, tariffs, quotas, taxes, etc.), financial state (cust/sup financial strength/ratings, etc.), technological issues (ICE, fuel cell, hybrid, plug in, mobility e-service, etc.) and JIT (less inventory – higher turnover).

These threats can be **identified, monitored and mitigated** through a set of means such as **geographical mapping & modelling, political and legal monitoring** per country/region, **consumer studies/forecasts** by markets (EU, NAFTA, AP, etc.), **financial audits** of business partners, **technology awareness, and so on**.

Successful OEMs have created a **differentiation factor** to achieve a **competitive advantage** through a five-step process:

1/ Recognizing (for incumbent OEMs) or establishing (for newcomers) the proper business model: either **fully integrated** or **supplier-based**. Although both models are supplier-based, in the case of the former model, the suppliers are either owned or controlled by the parent company or part of a “keiretsu” or equivalent system (i.e. Koreans and Japanese OEMs).

2/ Pre-event: adapting one’s organization/structure to ensure the following departments are formally established, staffed and communicating with each other:

- Risk Management
- Security
- IT
- Communications
- Purchasing/Procurement

3/ Post-event: ensuring that the following mitigation ad hoc teams and procedures are immediately operational and efficient:

- Crisis Management
- Business Continuity Planning (BCP)
- Emergency Response Planning (ERP)
- Communications
- Business Impact Assessment (BIA)
- Business Resumption Planning (BRP)
- Service Continuity Management (SCM)

4/ Mitigating the impact on non-transferrable risks:

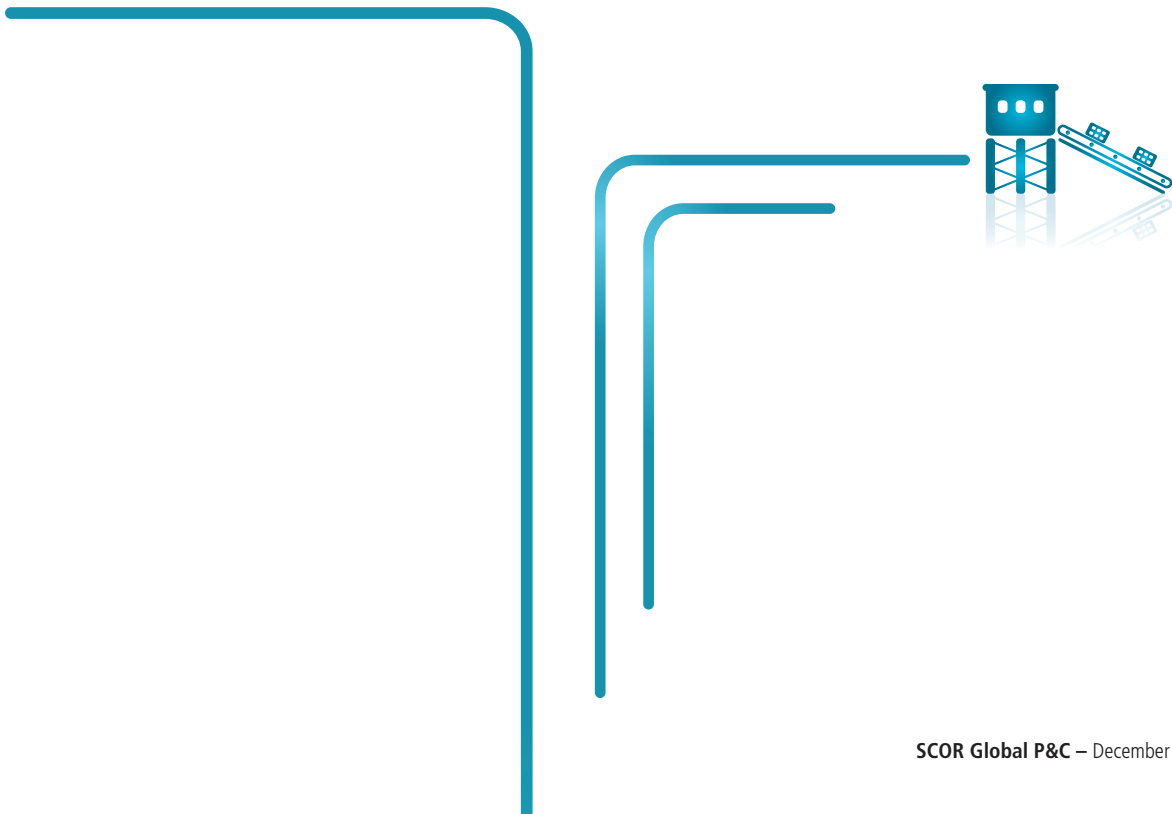
- Market shares
- Brand image
- Greater MPLs than limits purchased for CBI, EQ, flood, wind
- Timing (product launch)
- Flexible manufacturing: although originally designed as a cost reduction technique, flexible manufacturing does serve as an effective tool in mitigating Business Interruption exposure.

5/ Transferring the residual risks at acceptable and sustainable terms and conditions to insurance partners.

Today, under the best practice leadership of such global OEMs, the automotive industry enjoys one of the most **sophisticated** and **resilient supply chains to be found** in all industries, with little frequency anticipated.

However improbable, a disruption to the automotive industry’s supply chain would be far reaching, impacting several industries and various geographical regions, spreading through a complex matrix of multiple players (partners, customers and clients) with frequently misaligned interests, and generating potentially severe consequences.

In such a scenario, only the best in class will be resilient enough to overcome the crisis, often achieving a competitive advantage over their peers.



6

MODELLING THE EFFECT OF CATASTROPHES ON INTERNATIONAL SUPPLY CHAINS

DANNY RALPH

Director of the Centre for Risk Studies
University of Cambridge

Verbatim report*

“Sony’s production and sales were severely affected by the earthquake and tsunami in Japan... supply chain disruptions and a shortage in power supply... forcing Sony to curtail production.

Its fortunes were hurt further by floods in Thailand later in the year...”

BBC News 11 May 2012

Thank you to the SCOR team for finding me and bringing me here. I will describe some concepts and then give you a demonstration of a tool kit for looking at supply chains and how shocks affect them. In a certain way, it’s not too far away from the approach that we heard this morning from Catherine Geyman. My real purpose in being here today is to ask the insurance industry whether it is possible to provide the data that we need to do this kind of analysis. Part one of my talk will be a bit of philosophy and hand waving, and part two will demonstrate a tool kit.

We all know about Natural Catastrophes and other major incidents but how do they impact your business? One of the reasons to mention recent events with a global impact is just to remind you that the effects or the origins of different catastrophes can be quite different.

Hurricane Sandy is obviously a Nat Cat, but the Arab Spring was entirely different. As for the credit crunch, what’s the effect on a business if you run out of liquidity? Here’s a pandemic at the bottom. We have Nat Cats, we have pandemics, we have strikes, we have social unrest and we have wars. Not all of these fall under the remit of insurance.

Before I get to the core of this presentation I want to mention a different way of looking at the problem using the example of the 2011 Japanese earthquake & tsunami. We can take a very macro view and look at the volume of trade flows between Japan and various countries, and this macro view can show you the shift in those trade flows which is an indicator of the scale of the damage. For example, the Japanese Government may just sell off a few U.S. Treasury bonds. Why? Well, when you’re short of cash, you’re going to sell your bonds, you’re going to cash up and you’re going to do stuff with it. It’s not just manufacturing. Yes, there are major manufacturing shifts and China may be a winner with manufacturing moving to China, but there are also some financial shifts. Japanese investors in Indonesia sell off Indonesian assets. You would imagine these effects are secondary, but they affect the financial markets. Again, this is something that we haven’t really discussed, what are the financial and macroeconomic financial effects of a natural catastrophe? I won’t be tackling things at this macro-economic level, but I think this topic deserves with further discussion.

* Edited transcript

Regarding the cost of disruptions I'm not going to spend too much time on this other than mentioning some academic papers that tackle different aspects of this. Rice and Caniato (2003) look at examples of the cost of disruptions. It tries to, if you like, explain the risks that you face on a daily basis. Hendricks & Singhal (2005) explain why your share price might dip as a result of supply chain disruptions. There's a 2004 Best's survey, which we might think is out of date, but we've seen a couple of other surveys mentioned of people's attitude to their major risks, and supply chain is still up there. Craighead et al. (2007) surveys trends in best practice for managing the risk of international disruption.

If we look at current trends and best practice, what have we got? Cost management and efficiency improvements. That doesn't sound like resilience. But we have heard from other speakers that in the automotive industry it's the switch from lean to flexible that actually gave you information and management tools for assessing risk. Supply base reduction has been mentioned before. That's about reducing the total number of suppliers and having stronger relationships, so that's a plus and a minus. You lose some diversification, but you perhaps gain in understanding of what your suppliers do for you and what you can do for them when there's a disruption. Global sourcing again is either a plus or a minus. Sourcing from supply clusters is part of this process such that supply concentration is a natural consequence of globalization.

So what are two consequences of industrial development? One is globalization itself. What has that done? In a certain sense we thought we were getting natural diversification from globalization as an addition to finding cheaper sources of supply. In fact what's happened is we've gained interconnectivity. I guess I didn't really say, but the risk center that I'm involved in at Cambridge University actually got started as a result of a series of conversations across the campus about six or seven years ago. There were two years of these discussions and the risk center at Cambridge formed about four years ago. The discussions were about complexity and there were a group of people

like me that met and we discussed complex systems. Now, some were systems from biology. For example, why is it that a plant disease will spread from field to field? There were systems in telecommunications, power networks, transportation, supply chains in food in particular and so on. It was a very wide variety of people across the campus with different expertise but all with a common interest in how networks work and interconnect.

The one thing that we all had in common was that we noticed that our systems became more resilient to small scale interruptions as they got bigger and the networks extended. Why? Very simply, because if something went wrong in one location, you could route flow around it and you could localize the problem. At the same time, you lost the ability to measure the "system temperature". It was very much harder to tell if the system was approaching a disaster or not by looking at the load on single links. Imagine sending a telegram across the United States from San Francisco to New York. If you've got single links from one side to the other, you know when the traffic is overloading the network. As the network gains complexity and becomes more like a mesh and less like a few long lines, you just can't tell how close you are to a network overload. When it fails, you now have a much bigger system that fails all at once. That's basically what we've been seeing through globalization, that same effect.

What I would take away from this is that in order to understand the risk, and again this statement has been said in four or five different ways today, the structure of your business matters. It's not just volumes. It's not just when I order a chip, I don't know where it comes from. I should want to know where it comes from if I want to understand the risk to my business.

The second thing that we've had to deal with, and this has been explained several times, is along with globalization came the drive for efficiency, total quality management, quality control and so we got things like Just in Time and so on and we were essentially sacrificing resiliency to efficiency.



Cambridge Risk Framework: Components of System Shock



<http://www.CambridgeRiskFramework.com>

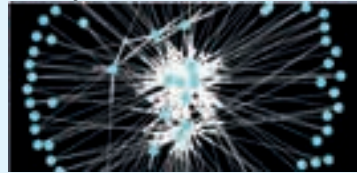
Threat Observatory



Network Manager



Analytics Workbench



Strategy Forum



What I'll present to you very quickly is an idea that's quite simple. The Cambridge risk framework shown above is a sort of tool box. At the moment it's mostly analytical. What we'd like to do at the beginning is understand the perils and understand the threats. We're focussing on 1-in-100 year risks partly because of Solvency II. It could be 1-in-200 or 1-in-100 or some other number. If you talk to a business and say that you're worried about 1-in-100 year threats, they'd say, "Are you crazy? The CEO is not going to be here in three years so why would I care about 1-in-100?" But mostly when you go to the top of the business and ask which threats they are worried about, very quickly they'll say that 1-in-20 or even 1-in-50 year risks are pretty important because we see a 1-in-20 risk every three years. Large companies are exposed to many perils across the globe. We don't know where they'll turn up, but they turn up more often than we think and we've discovered that we're affected more than we thought we would be.

The second part is to try to understand the operational structure; what is it about my business and how do I understand that? What I'd like to do is, if I use a word

that has been used this morning, can I overlay the perils that I think are out there onto my business and see what my exposure is? Of course you'd like then to understand how you could react. What's the cost of resilience and what is it buying me?

This is a progress report on where our studies are to date. I think the real problem for a tool box like this is how to find the data that would make these analytics really useful.

Moving past the philosophy, I'll show you some of these tools starting with describing a particular threat scenario, but let me give you a little bit of an overview first. Pomegranate is a fictitious electronics manufacturer. It makes laptops and it makes tablets. It's the ninth largest international player, sells its products in over 75 countries, produces over 10 million laptops and tablets per year and we're looking at a particular product which we've dubbed the Persephone. It's a 4G tablet and it's the new flagship in the range. We've built a fictitious supply chain as shown on the following page.

Tablet Supply Chain Supply Chain Tiers 1, 2 and 3



This scenario is based on work coming out of MIT, largely on where the raw materials that go into electronics manufacture, particularly laptops, come from. What we've done is we've also built on top of that knowledge of the main sub assemblies: battery, chip, final assembly. The final assembly happens in Southern China, other activities include plastics processing and several kinds of silicon fabrication and purification. This looks messy, but I don't think this captures one tenth of the actual complexity of the supply chain. As we work on the scenario we can build out the supply chain to Tier 1, Tier 2 and Tier 3. It's not shown but you can include retail or wholesale distribution too. We've developed a taxonomy of threats that we can apply to the mapped supply network.

We've tried to use information where available. So if the United Nations says national catastrophes come in certain categories, then of course we like to use the categorization already available. We tried to write down in twelve broad categories and about fifty subcategories the kinds of things that could go wrong. We can highlight categories where there are a certain number in breadth and depth of insurance products available.

I'll read out a couple of the categories. On financial shocks, Nat Cat, disease outbreaks and at least some elements of political violence and terrorism you have some types of good insurance. We've heard quite a bit about natural catastrophes, so that's a fairly obvious one. Interestingly, things like trade disputes and surprisingly some climatic events, like the one that I'm going to present now, for some reason are not higher on the radar.

The particular event I'm going to look at is a freeze event. The idea here is that for each one of these categories and for each one of these subcategories, for example drought, freeze and/or heat wave, we're producing a kind of stylized monograph which explains a bit about the history and the sources of data. What does 1-in-100 year mean, what's a big event and what's a small event? We'd like to be able to describe a 1-in-100 year event for each one of these so that there is some way to compare them. Then what we'd like to do is map them onto a business and ask which of these do you think matter to you? If you look across a range of them, you might notice that you're particularly exposed to several of these categories of catastrophes. Maybe that tells you something about where you should invest in resilience. This is a scenario-based approach.

This is a summary of the thought process that went into producing the freeze event. If you have a look at it, you can ask what the causes of freeze events are. Solar activity, solar flares, volcanic activity or ash into the atmosphere and climatological activity, of which we felt the last was the most compelling for a 1-in-100 year catastrophe. The historical record is buried there. Every 50 to 100 years a massive freeze occurs. For example, there was the River Thames in London freezing over and people skating along the Thames.

The kind of event that we came up with is a seven-week freeze. Roughly speaking, it has the chance of about 1-in-100 years. We've broken it into three zones. There's a deep freeze zone, which is the dark blue, then the medium freeze and then the mild freeze. In the deep freeze zone you're talking about temperatures at minus 20 Celsius and below going on for about seven weeks, half a meter to several meters of snow and gale force winds.

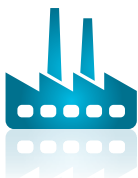
Footprint of 1-in-100 freeze scenario on top of tablet supply chain



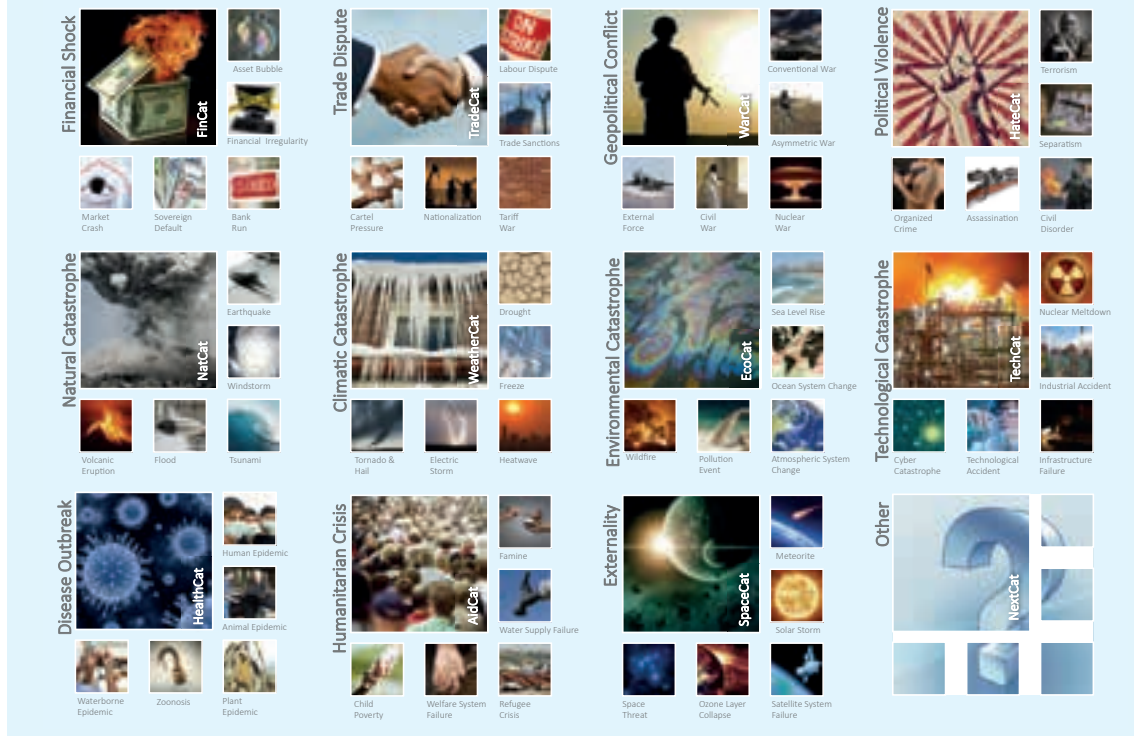
Superimposed on the Pomegranate international supply chain (laptop)

This particular freeze event comes out of a particular kind of blocking pattern. Over the North Atlantic there's a particular kind of weather pattern that's set up and for those of you who are interested in either wind farms for electricity or weather insurance, you might know that a lot of the statistics around weather events have shifted towards what are the dominant weather patterns. There are maybe five dominant weather patterns that you see in summer and a few in winter in the U.K. and it would be the same in North Europe and it would be the same in several different parts of the U.S.A. Once you select the blocking pattern, you know quite a bit more about what will happen in terms of weather. So we can map a blocking pattern to our supply network.

Now we have a stylized supply chain on one hand and that represents our business. On the other hand, we have one of a host of 50, or however many categories you like, of potential threats and we want to map one onto the other. That's the static picture of it and you can see these blue dots. They're the parts of the supply chain that would be affected by this freeze event. This scenario attempts to show how you go about building this. You select the threat, which is happening up there, so you'd have a menu of threats. You overlay the geographical footprint, which is all done with GIS software. You identify the nodes (plants in your supply chain) that would be affected and you can actually point to any node and it will give you information about it. Next we have the topological view where you've taken the globe away and all we see is the nodes and the links between them. There the Chinese assembly plant, in the centre, is seen to be clearly impacted in our model. It's the most connected bit and it impacts across the overall network.



Cambridge Risk Framework Threat Taxonomy



We're developing these tools and there's a slightly more advanced version of this one up on our website where you can go through and click "next" and see what happens. The goal here is to provide tools that allow you to do this kind of identification of your system and mapping of threats on top of it so that you're not just talking about one freeze event. You might be talking about several different kinds of events. What you're looking for is commonalities in the damage to your supply chain.

If you're going to get this far, then you'll also want to know what you should do about it. For example, should more inventory be stocked? If we should stock more inventory, where should it be stocked? Should we invest in greater capacity on our existing sites? Should we look for external suppliers, given that dual sourcing is a very standard response to supply chain risk? We haven't actually looked at alternative distribution, but we should, both within our supply chain and out to customers.

We can run alternative models and see what leads to greater resilience. In one particular example, holding inventory appeared to give the greatest benefit but we haven't yet worked through the cost figures, which is to say, what does it cost me to hold more inventory? Can you compare the cost of inventory to the cost of dual sourcing? One is an operational thing that you can check on a daily or weekly basis. Dual sourcing will change the way that costing is done because maybe 10% of the units will come from a location nearby, but you would like to have a contract with them to change that 10% to 50% in the next six weeks, so what do you pay for that option to boost production from a safe supplier? The opportunity is to map and then model the scenarios and look for resilient mitigation strategies in the face of a broad range of realistic threats.

So to conclude there is much more we can do in this area and we will continue to research and develop our models. We can develop a better appreciation of the threats to a business and how it impacts but what we have not been able to speak about today is business culture and relationships. But perhaps that is for another day.

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7

BI/CBI: RISK MANAGEMENT AND EXPOSURE MITIGATION

DIDIER SCHÜTZ

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Breaking the myth of confidence

Most of the time, the total impact of Business Interruption and Contingent Business Interruption is underestimated. According to some consultants, around 50% of relatively large organizations experiencing a major loss collapse within the next 2 years, while around 40% of medium-sized businesses fail within 5 years of surviving a major interruption to their operations. Companies that take more than 30 days to recover normal business operations are “highly likely” to go out of business. The reasons behind such failures are generally cash flow issues and the impact of the interruption on the company's reputation, which is an almost impossible asset to evaluate. The decrease of market share after a loss is also a major issue. Insurance will compensate property damage, Business Interruption and Contingent Business Interruption as per coverage terms and conditions, but there is no adequate protection for the loss of market share.

Preparation is everything; it separates the surviving organizations from those that disappear following a loss. An organization's continuity planning is often limited by two main considerations:

The first concerns the potential impact of a major disaster: organizations often consider that large-scale disasters are too costly or too big for their business to deal with.

The second consideration concerns time scale: short-term problems are usually dealt with on a day-to-day basis, while long-term issues such as a potential supply chain interruption are considered non-urgent. Companies often decide to wait until the next disaster, reasoning that if they survive it, then they are resilient enough.

Building resilient strategy

The first step in building a resilience strategy is to identify the risks involved and to understand the interactions between an organization and its economic partners, i.e. suppliers and customers and other dependent property. It is also important to understand the interdependencies between the different entities within an organization. The risk management process includes the following:

- Risk identification, including the weak points of the supply chain, the bottlenecks;
- Assessment of the potential financial consequences of an event and subsequent risk mapping;

- Risk response (prevention and mitigation);
- Residual risk financing (insurance);
- Risk auditing (evaluating risk response adequacy, taking changing situations into account).

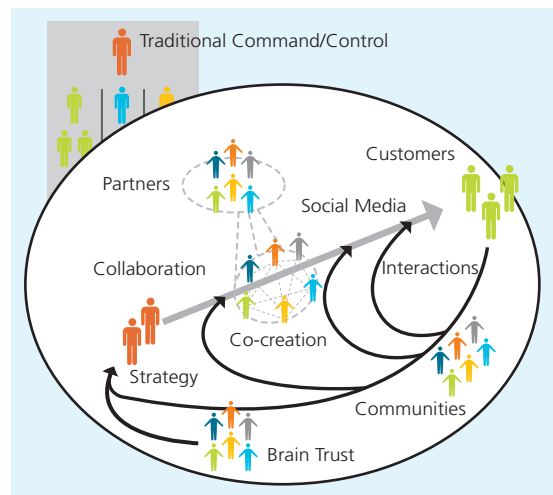
Adequate risk response includes a Business Continuity Plan (BCP). A BCP is a continuous, top-down and bottom-up risk review requiring the full support and commitment of General Management. BCPs are particularly suited to sites located in fully integrated complexes, with various interactions between process units – also called symbioses – and/or multiple sites



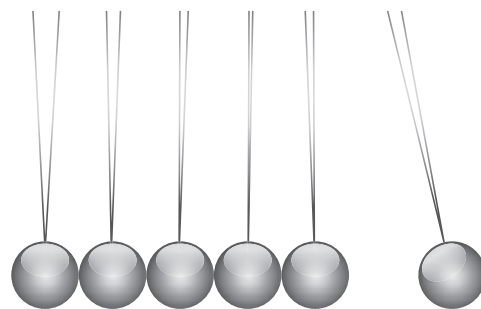
with strong interdependencies between plants of the same group and/or process units that can be also highly dependent on suppliers and customers (CBI). A BCP should be a formalized and well documented document, including alternative supply sources for the suppliers to the most critical process units. BCPs can also include the temporary relocation of some activities and production to third party outside the organization (including competitors when needed and possible), in order to maintain the brand on the market. The key for a successful BCP is to consider all possible scenarios, to avoid overestimated back-up or resilience capabilities and to ensure leadership.

A BCP alone will not ensure reliable securitization of the supply chain. It is intended to show the management's ability to control interruptions and is often designed as an *a posteriori* disaster supply kit. Thus, BCPs are not generally designed to prevent disruptions, but to help an organization to survive after disruptions occur. Because they sometimes only focus on certain scenarios, they do not always provide for the unexpected, making it more difficult for companies to easily adjust to major shifts in markets or operating conditions. Therefore, business models in general need to be more adaptive. Companies that can intelligently and effortlessly adjust to major shifts in market operating conditions are called adaptive businesses.

Adaptive businesses rely on networking strategy, which enables modern organizations to thrive in a world where each company and its suppliers are partnered with other companies. A company's network extends not just from its own plants, but also from its suppliers, customers, products and technologies.



Such network is critical to modern businesses, enabling a shift in market operating conditions to rapidly propagate far beyond its origin. If a company is not able to sense such a shift and respond effectively, it will lose value, damage its reputation and destroy the livelihoods of thousands of people.



The principles of adaptive business consist of:

- Embedding sensitivity and response capabilities in order to be able to detect any problems or opportunities early and correctly;
- Adopting a strategy promoting collaborative actions among network partners;
- Establishing intelligent knowledge sharing with business partners;
- Deploying technology to enable the above.

The adaptive business principles are just a framework. There is no template that can be replicated from one company to another.

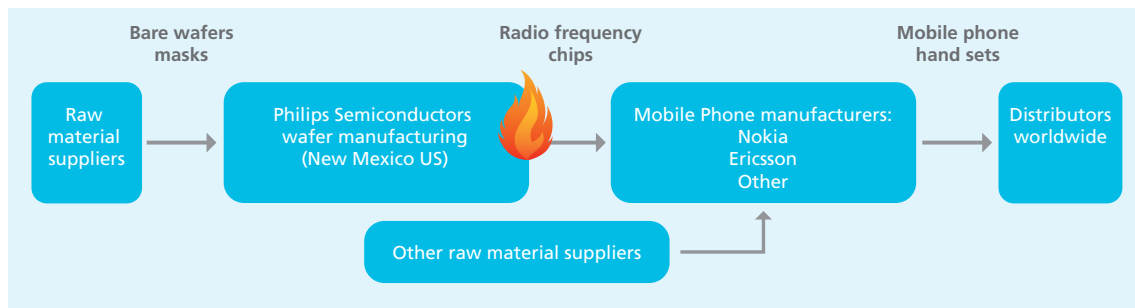
Once an adequate and robust resilience strategy is established, BI and CBI residual risks can be transferred to the reinsurance market. However, it is not a good idea to use "one size fits all" CBI coverage, because the specific CBI coverage needs are not properly defined.

The wording of BI and CBI insurance coverage should be crystal clear. Preference should be given to standard form contracts over manuscript policies, which can be unreliable. The three parties – insured, brokers and reinsurers – should be involved in the early stages of the process in order to prevent a situation of mistrust in the event of loss.

Examples of resilience strategy

Nokia CBI Resilience Case – 2000: the Erikson versus Nokia case is a classic example of supply chain disruption. At that time, the reinsurance industry was becoming increasingly concerned about CBI, and the fire affecting Phillips in the so-called Erikson versus Nokia case changed the sector forever. At the time of the event, the cell phone market was booming. All plants

were running at full capacity. The Philips semiconductor foundry, located in New Mexico in the US, was the supplier for critical components (such as radio frequency chips) to different mobile phone manufacturers, including Nokia in Finland and Erikson in Sweden. There was a fire at the foundry which contaminated the tools, Work in Progress materials and finished products.



Philips estimated that operations would be restored in about one week, after cleaning. At that time, Nokia had established what it called a "chip in the flow" management system, which meant that it detected a fluctuation in the chip supply chain before receiving the information from Philips. Nokia considered the fire at Philips to be a major event and believed that it would take more than one week to recover. As a result, Nokia was able to recover from this supply interruption by taking three key steps, as follows:

- Developing alternative plans with Philips, looking for other plants in the world;

- Redesigning certain chips to be adapted to cell phones;
- Finding alternative manufacturers, two within five days.

Nokia was not the leader on the cell phone market at that time.

Erikson was confident that Philips would restart production one week after the loss, so it did not manage the crisis in the same way as Nokia. This led to Erikson losing market share and Nokia becoming the leader on the worldwide market.

Toyota CBI resilience case – 1997: a fire broke out at a supplier's plant producing the crucial brake valves used in 99% of Toyota cars, resulting in the total loss of the supplier's plant. Toyota had a Just in Time type of supply chain with only four hours of supply on site for the P-valve. As a result, Toyota had to shut down 20 plants in Japan and lost 14,000 cars per day. Some experts at the time were convinced that Toyota would never recover. However, the company's resilience proved it to be a model of cooperation. Suppliers and local companies rushed to Toyota's rescue within hours, taking blueprints for the valves and arranging new processing lines, converting some existing processing lines in order to continue production. The truck bearing the first 1,000 P-valves arrived five days after the fire, enabling Toyota's car factories to restart production. Toyota's production losses were almost recovered with some extra shifts. Moreover, Toyota changed its strategy after the loss, initiating efforts to trim the amount of its part variations. Sole suppliers moved quickly to build "fail-safe mechanisms" (revamping production lines to make them more flexible or adaptable so that they could easily be shifted to another site in the event of a major disaster). As a result of all this, there was an even stronger link between Toyota and the companies that pitched in during its crisis.

The road construction company (resilience strategy generating business opportunities) – 2010: road constructors use large amounts of bitumen. Bitumen is a residue from the oil refining process and is a low added value product, currently in short supply on the market. This particular road constructor uses three million tonnes of bitumen per annum. The company

had already identified the shortage of bitumen on the market as a strong cause for CBI exposure, taking into account the highly competitive road construction environment with relatively few players. The road constructor decided to purchase a bitumen and lubricant refinery – vertical integration – with a contingent capacity of one million tonnes, which corresponds to approximately 33% of its needs. However, this solution introduced two major issues:

- Bitumen has to be transported hot to the road construction site. Since the refinery was located in the North of the country and the road constructor was building roads in the South of the country, the hot bitumen needed to be transported by barge or by road, resulting in extra costs.
- The refinery also produced a side product consisting of standard lubricant with low added value and relatively high production costs.

In view of these issues, the road constructor took the following actions:

- It became a bitumen producer for other road maker companies, selling bitumen to companies located in the North of the country and buying bitumen from other suppliers in the South of the country for its own road construction sites. This led to a cooperative arrangement with its competitors.
- It revamped the lubricant processing unit in order to produce specialized, niche product lubricant with higher added value, rather than the standard, low added value product.

This resilient business continuity plan resulted in a competitive advantage, with the risk turning into an opportunity to develop more business.





CBI: A CLAIMS PERSPECTIVE

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The scope and vulnerability of modern global supply chains has been demonstrated in stark relief in recent years by disasters in Japan, Thailand and New York after super-storm Sandy. Whilst it can be said that over the years it has been clear that damage arising from incidents occurring at a supplier's or customer's premises can have as profound an effect as incidents at the insured's own premises the impact has often been very localized. The current practices of "Just in Time" inventory management, single source supply and highly regulated supply chains create an increased vulnerability for business.

It is into this arena that the extensions to standard BI covers which are collectively known as Contingent Business Interruption covers (CBI) fit. These extensions are also known as dependency extensions and perhaps the most common are those of customers and suppliers which are the focus of this brief review.

Before we move to reviewing the covers in any detail it is worth a short recap of the central coverage offered by the standard BI wording (in writing this article the authors recognize that UK and US wordings will have variances and they are not seeking to comment in detail on these).

A typical policy recital of cover might be:

The Insurer agrees (subject to the terms, definitions, exclusions, provisions and conditions of this policy) that if after payment of the first premium any building or other property used by the Insured at the Premises for the purpose of the Business be accidentally

lost, destroyed or damaged (such accidental loss, destruction or damage being hereinafter termed Damage) other than by an excluded cause during the period of insurance (or any subsequent period for which the Insurer accepts a renewal premium) and the business carried on by the Insured at the premises be in consequence thereof interrupted or interfered with then the Insurer will pay to the Insured in respect of each item in the schedule hereto the amount of loss resulting from such interruption or interference in accordance with the provisions therein contained.

The key policy definitions from a claims perspective are these:

- **Gross Profit** reduction in GP as a consequence of the Incident
- **Incident** loss, destruction or damage to property in use by the Insured at the premises
- **Trend** trend in the business both before and after the date of the incident which **but for** the incident would have

The fundamental aspect of the wording is that damage has to have occurred as defined and that Gross Profit is reduced as a result of that damage. The BI wording is essentially an agreed indemnity wording which in most forms sets out that the prior year's turnover will be used as basis against which to measure any shortfall in turnover caused by an incident. The prior year's turnover will be adjusted to reflect any current trend in the business which BUT FOR the incident would have seen an increase in the base revenue.



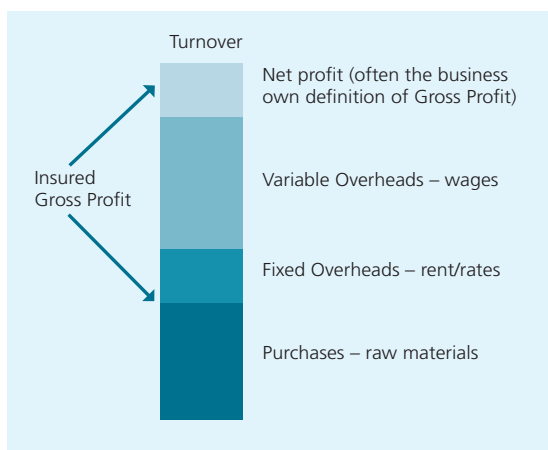
Flood situation in Thailand airport

In dealing with any BI claim whether for a CBI claim or other loss of turnover a key issue is to establish the applicable rate of gross profit and this can be a complex area as the policy definition of gross profit and a business definition of gross profit will not be the same. The policy definition will be typically set out as below:

The amount by which:

- a) the sum of the amount of the Turnover and the amounts of the closing stock and work in progress shall exceed;
- b) the sum of the amount of the opening stock and work in progress and the amount of the uninsured standing charges.

This can be illustrated in this way:



The policy formula is therefore:

a) Turnover (plus closing stock & closing work in progress) - Uninsured Working Expenses (plus opening stock & opening work in progress) = **Gross Profit**

b) **Rate of gross profit** = (gross profit / turnover) x 100

As can be seen it is clear that there are grounds for some confusion so in dealing with any claim we do need to be clear as to the policy cover and how Gross Profit will be assessed in any claims settlement. We will revert to key claims adjustment steps in due course.

As we have already remarked CBI cover is designed to extend the standard cover to reflect a wider range of potential exposures. An example of the extended cover for a supplier can be seen here:

*“Subject to the conditions of the policy, loss as insured hereby resulting from interruption of or interference with the business in consequence of damage at the premises of any of the Insured’s suppliers, manufacturers or processors of components, goods or materials **shall be deemed** to be loss resulting from damage to property used by the insured at the Premises, but excluding the premises of any supply undertaking from which the Insured obtains electricity, gas or water or telecommunications service”.*

Similar words can be used to extend cover to any customer or purchaser of goods and it can be seen that the key words are “shall be deemed”, in this way there is an incident and the reduction in gross profit in consequence may be recoverable under the policy.

In the event of an incident giving rise to a claim the primary requirements for the policy cover offered by the suppliers' or customers' extensions (the CBI cover) to be triggered, are these:

- There must be **physical damage** to property
- of the **type insured**
- caused by an **insured peril**
- to **dependent property**
- which results in the inability to supply, deliver, or accept goods and/or materials, supplies, services or the like, and
- **causes interruption** of the Insured's business.

If these criteria are met then the process of assessment of the claim will progress. To summarize the interruption to Insured's business must be caused by the physical damage at the dependent property. However this is a commonly litigated issue and the basis of this can include:

- Can be several reasons for interruption in the supply chain?
- Can be several reasons for interruption to Insured's business?
- Is the interruption of the **supply chain** caused by physical damage to property, or are there other potential causes, like:
 - Economic conditions
 - Disruption of utilities – electric, water, gas, etc.
 - Service interruption, off-premises power, rolling black outs
 - Infrastructure damage or closure – roads, ports, pipelines, common carriers
 - Regulatory – government imposed restrictions, safety issues
 - Availability of employees
 - Area wide effect of catastrophic weather event.

These will all be aspects that will need to be examined during the claims process and reviewed carefully as the claim is evaluated.

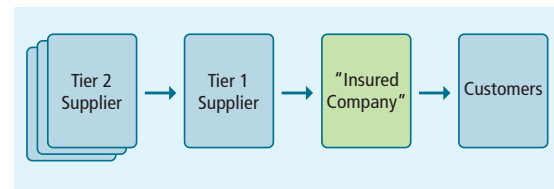
So before moving on let us take a look at a few of the reasons why CBI cover is bought. There are various examples but these can include:

- When a policy holder depends on a single supplier or a limited range of suppliers for components, for example if they are a car manufacturer or construction firm.
- It might be the case that the insured depends on very few suppliers for most of their merchandise, so typically they would be a retailer or a distributor of some sort.
- It could be when the insured depends on a few customers to purchase the bulk of their products, and we see that in some of the oil & gas industries and in the electronics industry for example.

We have seen condensing of the supply chains throughout all business in recent years and there can be little doubt that the evidence of what has been seen in Thailand makes it plain that CBI cover is an important tool in the insurance tool kit.

If we look at the supply chain from the perspective of a supplier's extension we can see 2 main areas of cover being described:

- Tier 1 Suppliers, also referred to as "direct suppliers" are typically identified in the policy as "named suppliers";
- Tier 2 Suppliers, also referred to as "indirect suppliers" are typically not identified in the policy and may be referred to in the policy as "unnamed suppliers".



The policy will typically contain clearly defined sub-limits for both tiers of suppliers, those for Tier 1 will generally be for a higher limit than those for Tier 2. Typically Tier 3 suppliers which are next back in the supply chain will be excluded from cover. This means that a key element of the adjusting process is to validate at what level in the supply chain tiers a supplier who has sustained damage sits.



When damage has occurred the initial step should always be to work with the insured to consider ways in which the loss or potential loss can be mitigated. There are a number of different avenues to pursue and these can include:

- Can the Insured make a complete or partial resumption of operations of the property insured, whether damaged or not?
- Can the Insured make use of other property at other insured location(s) or elsewhere?
- Is there stock (raw, in-process, or finished) at the insured location(s) that the Insured can make use of to offset loss of business?
- Can any of the damaged property be salvaged / scrapped to offset loss?

In any case the options will vary and it is only by working through some different scenarios and modelling these that the right decisions can be made. The policy can provide cover for any increased costs by dint of a wording such as this:

Contingent Extra Expense:

"The excess of the cost(s) incurred during the period of restoration, chargeable to the operation of the insured's business, over and above the cost(s) that would normally have been incurred to conduct the business during the same period had no damage occurred."

Options to mitigate may include a detailed review of any supply contracts to see if the supply chain can be flexed so that other suppliers can be used to fill a void in supply for the period of any interruption. In all this work it can often be the case that there is little or no detail coming from the supplier as to the extent of damage or time frames for repair. It is essential that the claims team works with the insured to establish as many of the key facts as possible but particularly in the case of tier two or three other suppliers this may not be possible.

In terms of evaluating the potential loss from any incident the main steps are these:

Seven main steps to settlement (having ensured loss covered by policy):

- 1/ How long is the indemnity period (the period turnover is impacted by the damage)
- 2/ Calculate reduction in turnover (e.g. compare last year's results with this year's adjusted for trend)
- 3/ Calculate rate of gross profit (as defined in the policy)
- 4/ Identify any extra expenditure
- 5/ Identify any savings and deduct
- 6/ Calculation of 1-5
- 7/ Apply effect of any deductible or other policy clause.

In all these steps we can take due account of various factors in assessing the actual loss sustained and these may be some of the areas to consider:

- Can the insured's customers wait? For how long?
- At what stage is inventory for supply to customers back to expected levels?
- What would production/sales projection have been in the period following the incident?
- Was there a reduced demand for product post-loss?
- If production/sales are limited, would pricing increase?
- Could insured shift production to a higher margin product?

The quantification of a Business Interruption claim is not an exact science but by working collaboratively an equitable assessment can be developed.

In this article we have sought to offer a high level view of the management of a claim under the terms of a CBI extension to cover. There are many key lessons that can be made from case studies around the world and we have sought to illustrate a few lessons. But one key lesson we would like to offer is that of stress testing a few simple scenarios for a breakdown in the supply chain and then looking at how best to mitigate any exposure. Insurance can provide finance and support when a loss or incident occurs but there it is not a substitute for a well-founded approach to supply chain risk management.

In concluding we would quote from one of the leading cases on the subject of CBI:

"Contingent is a misnomer; it simply means that the Insured's Business Interruption loss resulted from damage to a third-party's property." Pentair, 400 F.3d 613 (8th Cir. 2005).

Case Study Issue #1

Whether coverage exists where physical loss occurs at Tier 2 supplier only, and not at Tier 1 location

FACTS

- Claim arises out the flooding event in 2011 in Thailand.
- Insured is a manufacturer of cockpit assembly for an auto maker; assembly comprised of hundreds of parts coming from several different suppliers.
- Many of the suppliers (Tier 1) were unaffected by floods.
- However, many of the suppliers of the suppliers (Tier 2), did sustain physical damage and could not supply Tier 1 suppliers.

ISSUE

- Whether the loss for the cockpit assemblies should be measured by the profit lost on the individual parts from suppliers that were damaged by the floods, or the profit lost on the cockpit assemblies as a whole due to the Insured's inability to make and sell the cockpit assemblies.

COVERAGE

- Policy provides for "*loss due to the necessary interruption of business resulting from... damage or destruction of property that wholly or partially prevents any Tier 1 or Tier 2 supplier of goods and/or services to the Insured from rendering its goods and/or services...*"

ANALYSIS

- If damage prevented any supplier of parts for the cockpit assembly from rendering their goods, and this interruption caused a "necessary interruption of business", then there would be CBI coverage in accordance with the terms of the policy.
- The covered loss would be for the interruption of business, and **not** the interruption of supply.
- Therefore, coverage should be measured based on the lost profit from the cockpit assemblies and not lost profits from the individual parts.



Case Study Issue #2

Whether coverage exists for loss sustained by the Insured where operations are interrupted as a result of damage to the supplier of a customer

FACTS

- Claim arises from the same flooding event, and the same auto parts manufacturing company.
- However in this issue the Insured's customer did not sustain any direct damage as a result of floods, but was not able to operate because it could not obtain critical parts from its suppliers because its suppliers did sustain direct flood damage.

ISSUE

- Whether the policy provides coverage for loss sustained where the insured's operations are interrupted as a result of damage to the supplier of a customer?

COVERAGE

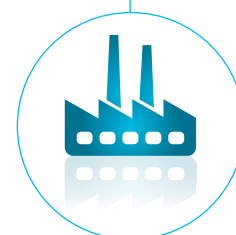
- Policy requires damage to "property that wholly or partially prevents any Tier 1 or Tier 2" supplier/receiver from rendering/accepting goods and/or services.
 - Under this wording, the Tier 1 or Tier 2 supplier/receiver need not have sustained damage, as long as there was damage somewhere that prevented the supplier/receiver from rendering/accepting goods and/or services.

ANALYSIS

- Indirect supplier will constitute a supplier for purpose of CBI coverage where the policy does not specify that the supplier must be a "direct" supplier. *ADM v. Phoenix Assur. Co.*, 936 F. Supp. 534 (S.D. Ill. 1996).

But...

- The product being supplied from an indirect supplier must be the same product received by the insured in order for there to be coverage. *Pentair v. American Guar. & Liab. Ins. Co.*, 400 F.3d 613 (8th Cir. 2005).
- There is a very respectable argument that such a broad interpretation of the Policy is unreasonable in that it would allow recovery where there was damage anywhere in the world, so long as that damage in some way prevented a supplier/receiver from rendering/accepting goods and/or services.
- "This Policy insures loss resulting directly from necessary interruption of business cause by loss, damage to, or destruction of property (of the type covered), including but not limited to property of the Insured, property of others, property of suppliers, property of customers, property in transit..."
- Thus there is a more persuasive argument that the damage must be to property of the supplier or customer.
- The issue of **whether the supplier of a customer can constitute a Tier 2 supplier/receiver is a complex issue which requires specific attention to the wording of the policy as well as the facts from which the loss arises.**



CONTINGENT BUSINESS INTERRUPTION AND WIDE AREA DAMAGE

HARRY ROBERTS
Consultant at Camford Sutton

*Verbatim report**

Before addressing various issues surrounding Contingent Business Interruption I would like to comment on some of the language and terminology that is commonly incorporated in BI policy wordings. As an example, cover for what is termed gross profit is widely available and the diagram at Figure 1 provides clarity as to what constitutes gross profit as defined in the policy. But why choose the term gross profit when other people, particularly accountants, often mean something very different? It is a mystery. It confuses the policyholders, and even their insurance advisers, yet we go on using the term. The joint CILA/III Research Study Group recently published a review of UK BI wordings entitled "Business Interruption Policy Wordings – Challenges Highlighted by Policy Wordings". One of their clearest challenges to the market was to ask "Why call it gross profit?" There is a real need to call it something else. Call it something to make people realize it's not what they assumed (with some justification) that it was.

Another term in regular use, but for which there is no definition or consistency is "Contingent Business Interruption". It's not helpful since all Business Interruption is contingent. There's no Business Interruption that isn't contingent upon something happening. Some policies provide cover that is contingent upon something that isn't physical damage. But they are rare, and for the vast majority BI cover is contingent upon physical damage. So in fact, calling it Contingent Business Interruption isn't helpful and it's tautology.

Prompted partly by what others have previously said over the last two days, I find myself asking whether Contingent Business Interruption, as those of us in this room generally understand it, is something that should be marketed and insured separately. I propose to consider the impact of isolated damage on a modern day supply chain, and then compare this with the impact of wide area damage on the same supply chain. In the illustrated case of Kettle Co. (See Figure 2) we had isolated damage, and I think that's what was really in people's minds when supplier extensions and customer extensions were first introduced.

Figure 1: Definition of Gross Profit

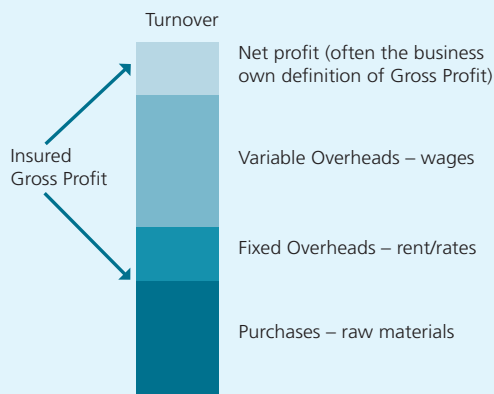
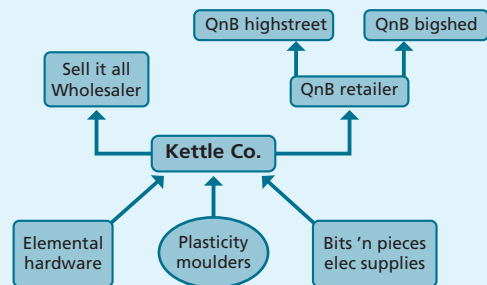


Figure 2: Kettle Co. picture



* Edited transcript

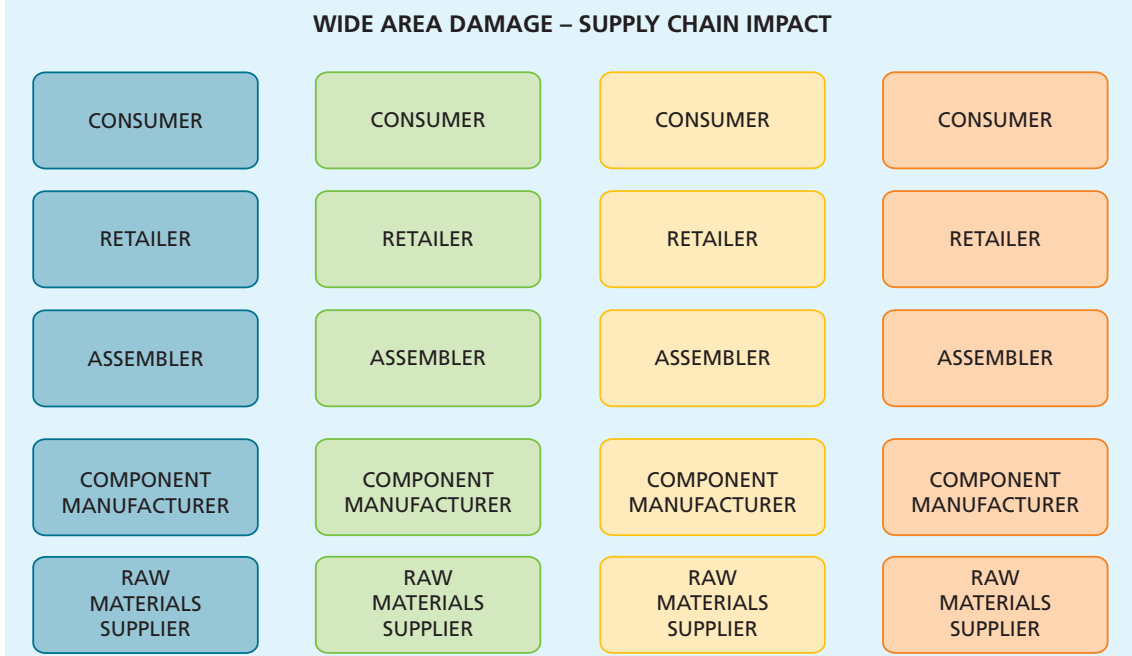
In that example, as in many cases nowadays, the manufacturer is actually an assembler. This should not, however, lead us to overlook the key role they play in the supply chain. They're key because quite often they are the people who have designed the product and what is more it's got their name on it. Supply chains have developed and diversified with outsourcing becoming commonplace, even to the extent that most manufacturing is carried out in developing economies. Thus, as with Ford in the past having their own rubber plantations, nowadays we have the same suppliers but without owning those businesses, or directly controlling their operating environment.

So what happens in an isolated incident such as a fire that takes out a component manufacturer? (As in the example of Kettle Co.) The supplier is out of action, so what do you do? Well, the most likely thing you'll be able to do is to find another component manufacturer. But in this very simple example of isolated damage, what is the reaction of the component manufacturer? Significantly, the component manufacturer is now in a position where they're embarrassed. The damage occurred at their premises, their business is at risk, you've found an alternative supplier and, therefore, they are desperate to re-establish their place within the supply chain. What will

they do? They'll offer incentives to win back their place in the supply chain. They will do all they can in order to get back into the supply chain. They're unlikely to plead force majeure, even if they could. The mere occurrence of an apparently fortuitous incident causing significant damage does not, of itself, constitute force majeure. Force majeure is a lot more complicated than that and, moreover, also differs according to jurisdiction.

What I now want to do is contrast the above scenario with wide area damage. Let's imagine that we have some competition and that there are four or five other major players in our market. It could appear to be like five or six discrete supply chains, each looking like the Kettle Co. example (See Figure 3). In reality, it's a bit more complicated than that because we could be buying from a number of different suppliers. Thus the same components may go into not just our products but also those of our competitors, a situation not uncommon in the motor industry. At the same time there are benefits in avoiding single sourcing of components. Likewise, along with our competitors, we are all selling to a broad base of consumers, via a variety of retail outlets, or directly, or online. What distinguishes our product is the design and brand.

Figure 3: Multiple supplier diagram



There is another significant and relevant point worthy of comment. In other presentations there has been mention of Tier 1 and Tier 2 suppliers. My experience of policy wordings is that they refer, in the first instance, to suppliers or customers, i.e. Tier 1 suppliers or customers. As for the Tier 2 level, they may be identified as "suppliers of suppliers". In this context it is also important to address the question of who is your supplier? Is your supplier the

person who invoices you for the goods? Is your supplier the person with whom you negotiate for the supply of the goods? Is your supplier the person who packs up the goods and dispatches them to you? It's really quite an important question because quite often they're not the same party. You do not necessarily receive the invoice from the person who sends you the goods. Just think of an agent in a particular country.

The agent may have control over the importing of these goods into this country and he invoices you. All he does is he arranges for the goods to be sent from where they're manufactured to you. He never sees the goods and the goods never pass through his premises. If his premises are burnt to the ground, from a financial perspective we don't care. His office can be destroyed and it will have no impact upon the supply goods at all. Lawyers have tried to persuade me that suppliers are the people with whom you are in legal contract. To my mind that view is far too simplistic and ignores the dictionary definitions of the terms supplier, and customer.

I want to further explore the wide area damage scenario by reference to a case that I had relating to the Thailand floods. Let's say a company purchases hard disk drives. Hard disk drives are used in a number of IT products nowadays and, therefore, millions of these things are being produced every year by a whole myriad of producers. If you want to purchase these products, then you will find that there are well established companies, including let's imagine Components Worldwide Inc. They have three plants around the world manufacturing hard disk drives. In risk terms this is excellent because if one plant in isolation goes down, then they have other plants from which they can provide these products. Indeed, there are other competitors for Components Worldwide Inc., who operate on a similar business model. The contract to purchase the hard disk drives is with the business which is incorporated in the United States, where there is no production of these components.

Components Worldwide Inc. delivers products from any one of its three factories. Indeed, it determines which of its factories sends you your product. You don't get to say, "I want my product manufactured in the Philippines, please." As it happens, in this instance our product is normally manufactured and delivered from the Philippines. We know this because it says so on the boxes in which the hard disk drives are delivered. Unfortunately, there was widespread flooding in Thailand and Components Worldwide Inc., decides that it is going to ration supplies to all of its customers whether they receive their product from Thailand or other locations around the world.

If we are to make a claim under a supplier's extension to our BI cover, we will need first to establish who our supplier is. Is it Components Worldwide Inc., in the U.S., which could be a problem? This is because Components Worldwide Inc. doesn't manufacture anything, and they might be deemed to be the supplier. On the other hand, it might be argued that it is the subsidiary in the Philippines who are the suppliers. Incidentally, these are all separate legal entities as one might expect with a group of companies operating in different territories.

As indicated above, Worldwide Components Inc is now rationing supplies of hard disk drives. Notwithstanding the flooding in Thailand, our insured was previously getting the vast majority of its product from the

Philippines. Does that make the Philippines subsidiary of Components Worldwide Inc. their supplier? If so, has our insured got a claim at all? The situation is unclear and there is a real need for greater clarity. One solution might be to have only named suppliers, and then it doesn't matter what tier they are if you've named them, because that's who you meant.

Let's have a look at the reaction of the suppliers in this Natural Catastrophe scenario. It is significantly different to the isolated damage scenario. There were four manufacturers of hard disk drives in Thailand. Each of them had other plants around the world, but essentially there was a worldwide shortage of this particular type of product. So what was the reaction of the component manufacturers? Were they desperate to re-establish their role? Apparently not. They seemed quite happy to say, "Unfortunately, there's been a flood and you're not going to get as much product as you got before." What they did was they offered to supply on new terms. New terms meant, you'll get less, but the quantities are guaranteed, provided you pay a higher unit price. The suppliers also invoked force majeure, seemingly as though this meant that the original supply contract was terminated, and ignoring any continuing obligation to use their best endeavours to fulfill that contract.

What is the significance of this reaction? Well, what it means is that individual losses could well be significantly greater in the wide area damage scenario than the isolated damage circumstance. But there is an even more significant issue to consider. Another speaker spoke about winners and losers in any particular scenario. Let's say that you're living in an area where there is significant wide area damage. Following that wide area damage, does the economy in your area suffer a downturn or does it enjoy an upturn? Audiences to whom I have posed this question have been pretty much split down the middle [This proved to be the case again] Everyone is correct because some elements of the economy will enjoy an upturn (e.g. if you are a supplier of building materials) whilst others may suffer a downturn (e.g. retailers of luxury goods). Within this impacted economy, and assuming they themselves have suffered no damage, it should be apparent that the winners won't be making claims. By way of contrast the losers will be making CBI claims if they have that cover.

At this point I want to return to the question of potential BI wording change. Apart from the inappropriate use of the term gross profit, perhaps the next most pressing need for change is in relation to wide area damage. UK wordings on wide area damage do not correspond, to the best of my knowledge and experience, either with the expectations of the policyholder or the underwriter. What options are there going forward?

In relation to wide area damage, we could follow the decision in Orient Express Hotels. Essentially, the decision said that in the circumstances of wide area damage, a

downward trend could be applied to the insured's business to reflect the fact that there were other financial impacts things that were caused by the peril, in that case Hurricane Katrina, and apply in effect what I call a windfall loss. To define a windfall loss you just think of what a windfall profit is and turn it on its head.

The legal advisors for Orient Express Hotels came up with a number of arguments of varying merit to support Orient Express Hotels' claim. The one argument that really struck a chord with me was that they said it seemed ironic that the wider the area damage, the less insurers paid, to individual policyholders. There's something fundamentally wrong about that. If you ask people what they expect, both policyholders and underwriters, they expect cover to be offered on a no windfall loss/no windfall profit basis. This sounds easy, but I question whether it is quite as simple as it sounds. You will have to forgive me as I have limited knowledge of reinsurance, but I have real misgivings about whether the insurance industry as a whole can afford, or even desires effectively to underwrite entire economies. That's what potentially we're talking about. If you think of something like 9/11, there's an impact beyond the physical damage. The event served to undermine confidence in the broad economy as well as instilling fear. One manifestation of this was the impact on aviation where the number of people choosing to fly dropped significantly following 9/11. This in turn affected travel agents. Consider, for example, a business that has a whole chain of agencies selling airline tickets and they're all suffering a downturn. One agency was in close proximity to the Twin Towers, so therefore they've ticked the material damage proviso box and they now want to claim for the entire downturn of their business, across the whole of the United States and possibly some of their companies in the rest of the world as well. On a no windfall loss/no windfall profit basis they would succeed. I have distinct reservations as to whether this is a result that we should welcome. Looked at on a more macro scale encompassing a wide array of business sectors, we have to ask ourselves if this is something that we as an industry can afford to underwrite.

The Holy Grail, in terms of a solution, lies somewhere between the two, but it's rather difficult to define and put into words. In the US insurers have tried to do it by specifically excluding windfall profits. Even that is no guarantee that such losses will not be recoverable as the case of *Berkshire-Cohen Associates LLC v Landmark Aon Insurance Co (2009) (US)* proved. Nor do US wordings, for that matter, address the issue of windfall losses. Gordon Hickmott was an underwriter in the London market in the last century. He wrote a number of books on *Business Interruption*, including one entitled "Interruption Insurance Proximate Loss Issues". In it he explains what was the market intention with respect to wide area damage. Essentially what he was saying was, "Look, we don't want to apply windfall losses. We're not trying to cut back people's claims below the level of the loss that they would have suffered given their own damage. But what we don't intend to pay for is the aggravation of any BI loss by virtue of wide area damage," – aggravation being either in terms of the impact upon their market or the impact upon their ability to reinstate the damage. The latter is probably best illustrated by the earthquake in Chile and the impact on its infrastructure which severely hindered people's ability to restore their businesses.

Unfortunately I haven't got the magic bullet to fire to tell you what that the required wording should be. Ultimately a wording will have to be found and, as other speakers have said, it will need to be crystal clear. If it isn't, then we will be faced yet again with the continuing uncertainty and indecision surrounding incidents such as the Christchurch earthquake, a state of affairs which has left local businesses in a state of limbo and has not reflected well upon our industry. Irrespective of whether the right wording can be found, I think there is also a need to consider whether the twin issues of CBI cover and wide area damage are best addressed by means of extensions to the core UK BI wordings. Purchased separately the potential issues surrounding CBI and wide area damage would be more likely to attract the pre loss consideration that they merit.



BI/CBI AND SUPPLY CHAIN MANAGEMENT: THE POINT OF VIEW OF TREATY REINSURERS

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Introduction

Treaty reinsurers work very remotely from the risks that they cover. With regard to BI/CBI, they do not and cannot know the policyholder or how it handles its supply chain risk management. It is therefore very important for them to understand the risks that they assume by creating an accurate risk profile of the business involved, by identifying and controlling accumulation at both a treaty level and at SCOR level, and by capping per-risk and per-Cat event exposure.

This section will look at the transfer of CBI exposure to treaties from a (re)insurer's point of view. In the light of the lessons learned from large Cat events such as the Thai floods, it will present and discuss SCOR's recommended best practice to its ceding companies for underwriting CBI exposures transferred to treaties. Insurers and reinsurers have a key role to play in terms of promoting best practice, with a view to ensuring that CBI exposure remains insurable and reinsurable.

THAI FLOOD: OVERVIEW

The Thai floods of October and November 2011 marked a turning point for CBI awareness. This massive Cat event came very shortly after the Tohoku earthquake of 11 March 2011. Three months of heavy monsoon rains severely flooded one third of Thailand's 77 provinces, killing around 400 people and affecting 9 million. The economic losses were estimated by the World Bank at around US \$ 50 billion. Insurance-wise, seven major industrial estates were heavily flooded: around 1,000 factories were forced to shut down production and the insured loss estimate for the event totalled US \$ 16 billion, with a material contribution from CBI losses.





Famous wooden Mon Bridge – Thailand

Following the Japanese earthquake event, it was starting to become clear that CBI cover for sophisticated policyholders with critical supply chains in cat-prone areas was too complex to be written within a property policy ceded to treaties.

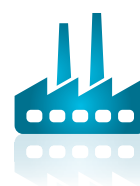
The Thai floods further highlighted this issue of treaty coverage for CBI exposure arising in cat-prone countries, revealing the following deficiencies:

- Vague original insurance policy language:
 - The Average Clause was at times exploited in order to lower premiums and raise indemnification, without taking significant underinsurance into consideration.
 - The “New for Old” basis of settlement (or replacement) wording did not accurately reflect the fact that such cover was intended to replace non-obsolete insured property. Actual cash value settlement was used as a hybrid basis for the replacement policy.
 - Wording was unclear as to whether and/or how CBI cover extended to broader economic losses caused to the wider area due to the catastrophe. “Wider Area Damage” contributed significantly to most BI/CBI losses.
- Vague treaty wording:
 - CBI clauses sought neither relevant underwriting information nor restricted exposure.
- Lack of reported information on CBI exposure:
 - A few very large single losses arose from the cession of large customers’ and suppliers’ extensions, completely distorting the treaty’s risk profile.

- Difficulty of setting up loss reserves, even months after the events:
 - CBI losses, by definition, involve third parties and therefore take time to be ascertained;
 - There was a shortage of qualified loss adjusters, valuers, and repair/restoration workers, which delayed the loss adjustment and payment/settlement processes;
 - Large lump sum payments were made by cedants when only limited loss information was made available.

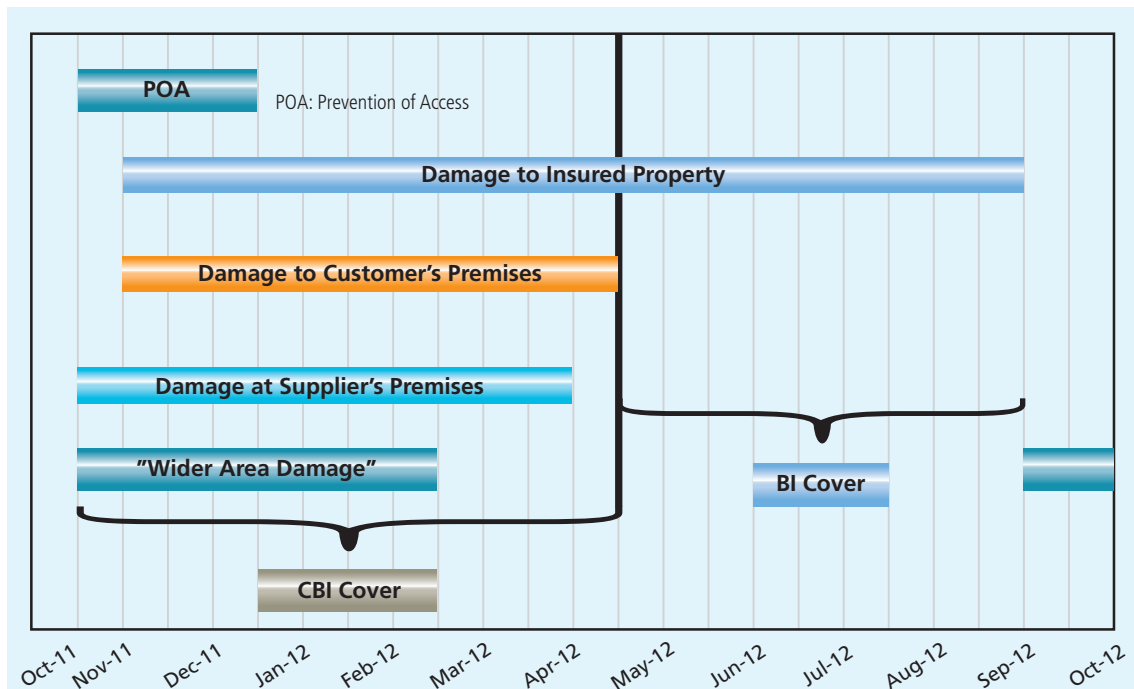
THAI FLOODS: LESSONS FOR INSURERS AND REINSURERS

The Thai floods were a great lesson for insurers and reinsurers alike, and highlighted the major challenges involved in the settling of CBI claims. CBI losses take time to be ascertained because critical suppliers/customers are considered as third parties; hence there is no access to the Tier 1 supplier’s premises and no way of verifying its material damage and expected reconstruction time. Moreover, it was very difficult to verify some of the sales figures provided, especially where Non-Disclosure Agreements (NDA) were in place.



1/ The widespread nature of the Thai floods triggered concurrent BI causes (including non-damage), which made it difficult to apportion the losses

between CBI and BI, and between the insured and the insured causes of the loss.



The figure above is a typical timeline showing an insured's Business Interruption caused by flooding at an industrial park in Thailand:

- The flood water prevents access to the park at the beginning of October 2011 and enters the park 10 days later;
- The insured has to reduce or stop its production, although there is no property damage at its premises, due to several concurrent causes that may include "prevention of access", "failure of public utilities"; "closure by public authorities" and critical suppliers' and customers' Business Interruptions;
- Its supplier's premises are damaged mid-October;
- Its own premises are damaged at the end of October;
- Its customer's premises are also damaged at the end of October.

The water recedes at the beginning of December 2011. The insured's supplier reinstates at the beginning of April 2012, the insured's customer reinstates at the end of April 2012, and the insured reinstates at the end of September 2012.

So, provided that "Prevention of Access" and "Closure by Public Authorities" are covered under the policy's extension, the CBI covers Business Interruption from the beginning of October 2011 to the end of April 2012 (i.e. 7 months), while

the BI losses caused by Property Damage – PD – (on the policyholder's premises) will be restricted to the period from the beginning of May 2012 to the end of September 2012 (5 months). This replaces 11 months of Business Interruption caused by damage to insured property.

- There might also be another element of non-damage BI loss due to "lack of attraction", as sales could be sluggish and therefore production may not be running at its nominal value, even though the assets have been reinstated.
- 2/ The next section highlights the issues raised by the wording of a few non-damage BI extensions that are available in Asian markets:

Prevention of Access/Denial of Access

The title is broad (as goods and products could be stopped due to port blockage or the unavailability of railways or motorways); therefore the wording is intended to narrow the cover.

- *Is floodwater on the surface of a road considered damage?*
No, but if it goes to court the insurer will lose. The court will "read down" a contentious clause (i.e. will make it fit the circumstances of the event)
- *How is "immediate vicinity" defined?*
The common understanding of immediate vicinity is "just outside the premises".

Public Utilities

- Requires damage to TP (critical part): if the authorities switch off supply as a safety precaution, does this clause apply?
No, as it is not an insured peril (CBI is triggered by a physical loss).

Closure by Public Authorities

- Are evacuation notices issued by the Authorities during flooding specific enough to trigger the cover?
No, they are too generic. A safety warning would not be covered, but a compulsory evacuation would.

3/ Major insurers have revised their best practices for underwriting CBI extensions and provided a full list of ceded policies with suppliers' and customers' extensions. The following guidelines serve as a best practice approach.

Contingent Business Interruption (CBI) guidelines (applicable to Fire / Industrial All Risks (IAR) and Engineering).

Common CBI extensions are customers' and suppliers' extensions, denial of access and public utilities. These extensions are subject to the following guidelines:

- Coverage granted only as a consequence of insured physical perils.
- Suppliers and customers on a named basis; unnamed ones subject to a restrictive sub-limit – no higher than 10% of the Business Interruption sum insured (100% original policy limit) or US \$ 5,000,000, whichever the greater.
- For suppliers and customers located outside XXX, XXX, and XXX, insured perils restricted to FLEXA (Fire, Lightning, Explosion, Aircraft) only.
- Appropriate sub-limits and time excesses (e.g., generally no lower than 3 days).

- Specifically priced; individually underwritten.
- Accumulation potential monitored.

Reinsurers added some treaty restrictions when the level of information was not adequate or the "perceived" ceded CBI exposure was not commensurate with the risk profile and balance of the treaty. Ceding companies were also asked to provide information on the top-10 largest suppliers' and customers' exposures ceded to the treaty.

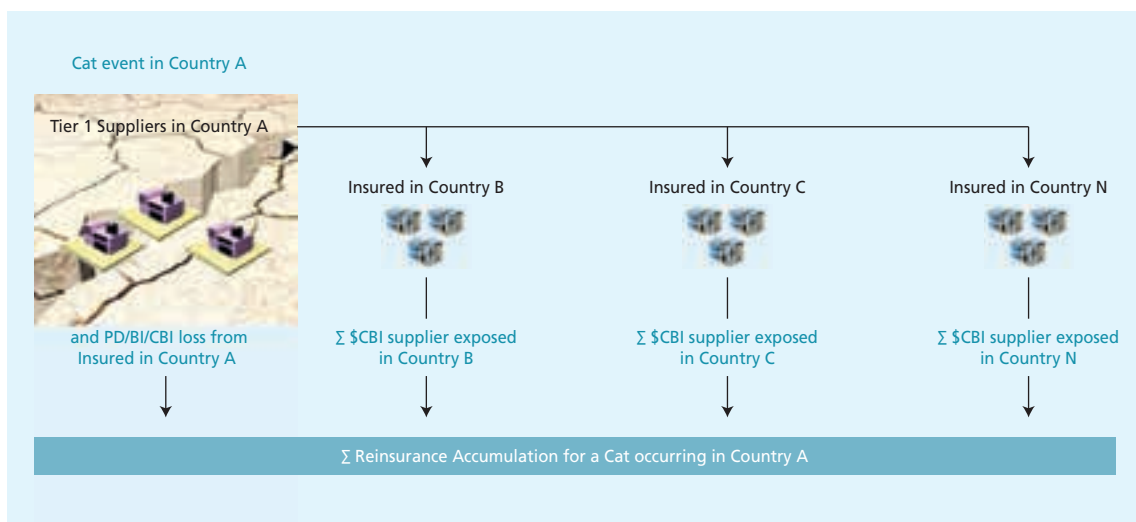
The reinsured must stick to the following underwriting practices in order to underwrite extension(s) on the policy for suppliers and customers and/or public utilities and denial and/or prevention of access:

- Named suppliers and customers: sub-limits must not exceed 20% of the limit of liability for Business Interruption (sum insured or loss limit) on any one policy.
- Unnamed suppliers and customers: sub-limits must not exceed 10% of the limit of liability for Business Interruption (sum insured or loss limit) on any one policy.
- Public utilities and denial/prevention of access: sub-limits must not exceed 90 days or the equivalent amount of the annual sum insured, subject to a maximum of US \$ 20 million on any one policy.

Additional premiums must be added to the policy for any CBI exposure; the reinsured is required to provide:

- A quarterly bordereaux for CBI exposure to the lead reinsurer and/or SCOR;
- Specific information for any CBI risks to the lead reinsurer and/or SCOR upon request.

The diagram below shows that treaty reinsurers can get a nasty surprise from the large losses caused "outside" CBI.



A Cat event strikes in country A, which is cat-prone and for which the reinsurer monitors its accumulation.

There are PD/BI/CBI losses in country A.

There are also CBI losses outside country A, in countries B and N, due to PD/BI losses impacting critical suppliers.

The total loss accumulation for a Cat occurring in country A includes the total CBI losses outside the country.

With this in mind, treaty reinsurers need to ask the following questions:

- What are the contributions by countries B, C and N to its Cat PML in country A?
- What is the best way to charge for this?

As part of its recommended best practice, SCOR advises the information necessary to address those two issues.

WHAT IS BEST PRACTICE RECOMMENDED FOR UNDERWRITING CBI?

Best practice is a set of guidelines, constructed by SCOR’s Underwriting Management Department, designed to guide SCOR treaty underwriters in their discussions with ceding companies.

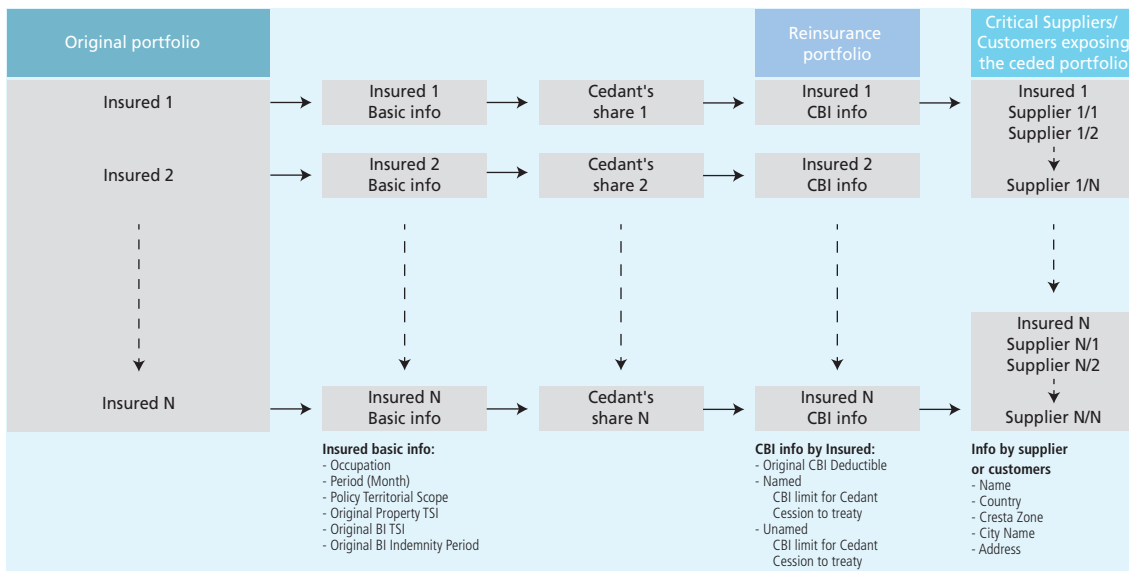
The objectives of the best practice guidelines are:

- to ensure that proactive measures are being taken to effectively monitor and manage exposure;
- to keep treaty exposure to a justifiable and manageable level for SCOR;
- to persuade ceding companies (for which SCOR is a core reinsurer) to incorporate best practice guidance into their underwriting guidelines and to implement this, even if these conditions are not incorporated into the treaty contract wording.

This best practice document, which is based on SCOR’s experience of the Thailand floods, Hurricane Sandy and the Tohoku earthquake, is for guidance only.

- It constitutes a reference for SCOR’s treaty underwriters when they discuss treaty terms and conditions (when SCOR leads) or when they underwrite a share (when SCOR follows).
- It covers several topics, including the information that needs to be collected (from the original insured) in order to effectively manage the suppliers’ and customers’ extensions in the portfolio covered under the treaty contract. It also deals with coverage issues and treaty conditions.

What underwriting information needs to be collected in order to effectively manage the suppliers’ and customers’ extensions in the portfolio covered under the treaty contract?



This is a real-life example of a property surplus, with around 60 property policy cessions with material exposure of suppliers’ and customers’ extensions, in industries such as electronics, chemicals, foods, etc.

For such surplus treaties, large corporate risks (i.e. with higher PML/SI) are ceded. CBI exposure can stress the treaty risk profile, and potential outside CBI losses are a major concern.

- The cedant provides basic information about the policyholders, without providing their names.
- For the portfolio to be ceded, the ceding company provides a second set of information with the CBI information by policyholder.
- The cedant provides a third set of information for each critical supplier.

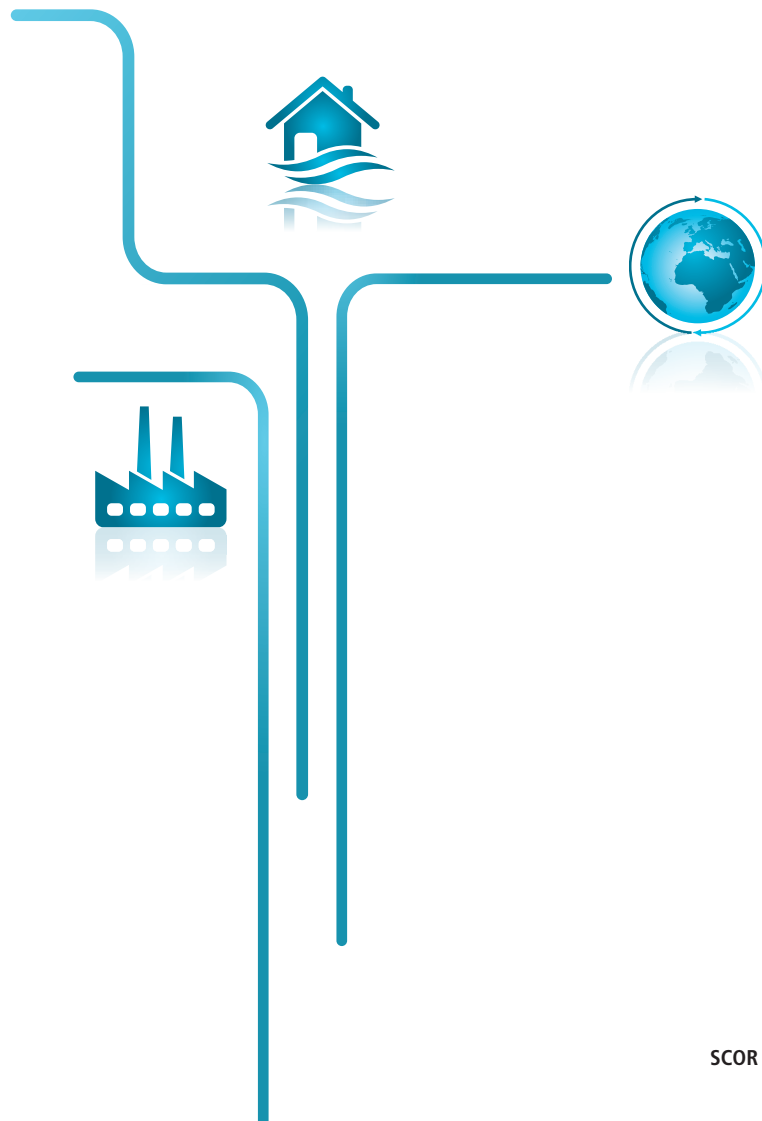
Conclusion

Large insureds in Asia have been more aware of supply chain risks since the Tohoku earthquake and the Thai floods, and their need for CBI cover is much higher. However, the main property insurers are reluctant to offer coverage. While keeping their clients' needs in mind, they re-assess each CBI cover and try to simplify and/or restrict the coverage. For example, reported CBI lists show that CBI limits have decreased for both overseas and domestic clients. Policies are stipulating "no unnamed suppliers" and "all unnamed suppliers to be named".

Large manufacturers of high-tech and sophisticated products focus on their supply chains and BCPs (Business Continuity Plans and Business Contingency Plans), choosing to insure their most critical suppliers and customers and omitting those that are not critical.

Each market, each ceding company and each treaty is specific and SCOR treaty underwriters spend time with their treaty clients to review and analyse the CBI exposure that they wish to cede to treaties.

Insurers and reinsurers must share their best practices in order to maintain the insurability and re-insurability of CBI.



ACCUMULATION COVERS (SUPPLY CHAINS & CBI)

VICTOR PEIGNET
Chief Executive Officer
SCOR Global P&C SE

Although Contingent Business Interruption (CBI) is far from being an emerging risk, it remains a surprisingly little-known one. The depth of risk management surrounding CBI varies considerably between the industrial, financial and (re)insurance players in the chains of risk financing, management and transfer. Markets have been experiencing major CBI losses on a regular basis for many years, and recently these have become more frequent. The fact is that, year on year, the complexity and the size of

CBI losses keep increasing, whether the triggering events are man-made, or natural catastrophes like the earthquake and tsunami in Japan or the floods in Thailand in 2011.

It is therefore becoming essential that both insureds and (re)insurers recognize CBI as a major exposure, and that they work together to apply Enterprise Risk Management policies and techniques that can deal with it in a pro-active way.

A balance to find between greater transparency from insureds and pragmatism from (re)insurers

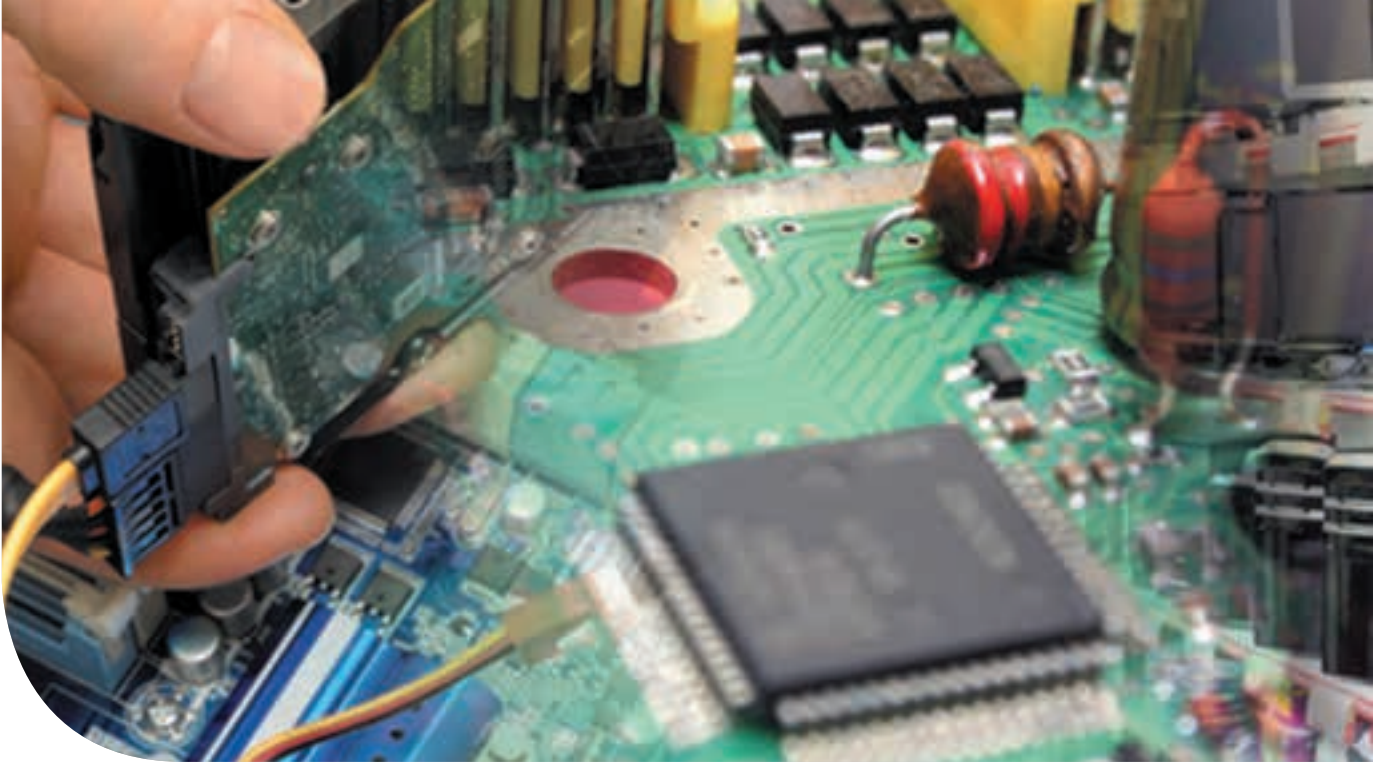
For insureds, this means being more transparent with regard to (re)insurers, and finding ways to overcome the commercial confidentiality barriers that hamper the provision of available information and therefore prevent the best achievable representation of their upstream and downstream physical and contractual dependencies, and of their plans relating to contingency, mitigation, business continuity, recovery and crisis management.

For their part, (re)insurers need to make a far greater effort to understand CBI exposures, to take a systematic approach to the quantification and pricing of such exposures and to control accumulations through best practices in terms of underwriting. At the same time, they need to be as practical and pragmatic as possible, particularly regarding the requirements for detailed information, and to be ready to offer solutions that are manageable for both the insureds and themselves.

Going back to basics: CBI definitions and key features

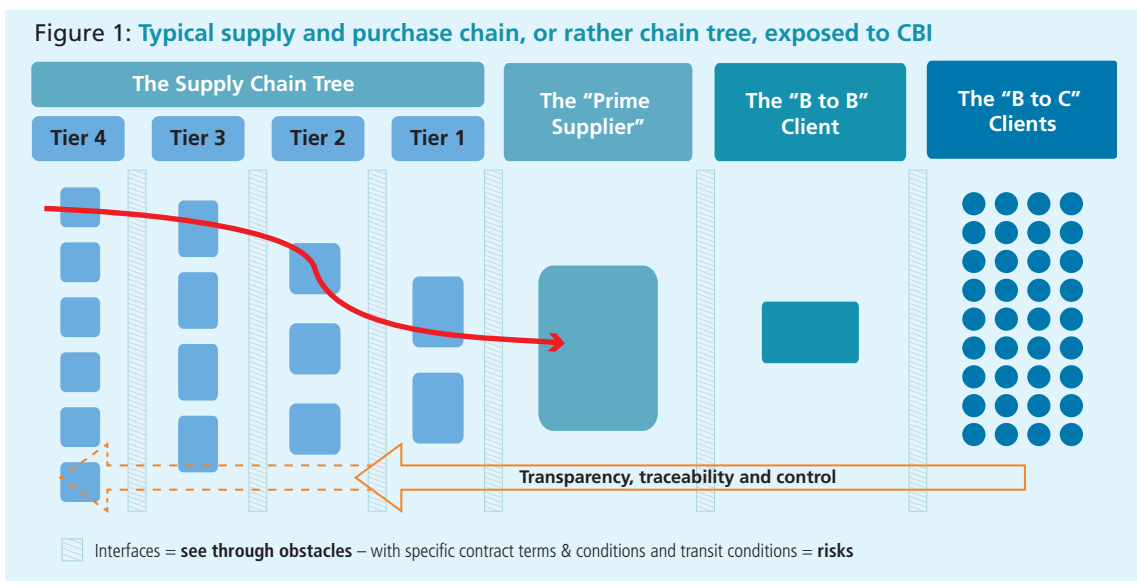
CBI losses occur as a consequence of events in a third-party company or in the policyholder's surroundings, without the policyholder's insured properties themselves having suffered physical damage. CBI insurance cover provides the policyholder with protection against loss of profits caused by interruptions to supply or purchase chains, or limitations in terms of access, as follows:

- Loss of policyholder's profits caused by suppliers' and/or customers' non-fulfillment of their contractual obligations to supply or take delivery, respectively arising from the occurrence of one of the perils covered in the policyholder's property policy (Physical Damage & Business Interruption);



- Loss of policyholder's profits resulting from the failure of public utilities (such as the supply of electricity, water, steam or gas or telecommunications services);
- Loss of policyholder's profits due to a loss from a peril covered under the policy (an insured event) at a third party's premises, which prevents access to the insured company;
- Loss of policyholder's profits due to its own domestic or foreign interdependencies. An interdependency loss is one in which property damage occurring in one of the plants of an insured company results in an interruption to business in another plant of the same company. "Interdependency losses" are normally included in standard Business Interruption (BI) insurance cover. However, if each entity / subsidiary buys a separate policy, e.g. in the case of multinational operations, joint ventures or minority shareholdings, then interdependency can be construed as CBI. In the specific case of vertically integrated business models, considerations for aggregated CBI losses and ways and means of composition do come into play if the affected entities or subsidiaries belong to the same parent company, and if that parent company consolidates its financial results or operates with transfer pricing arrangements. Such cases encompass the interrelationships between local insurance policies and global / master insurance or captive reinsurance policies;
- ICOW (Increased Cost of Working) and possibly AICOW (Additional Increase in the Cost of Working) directly related to a CBI loss, which normally starts when the insured suffers a reduction in turnover from a physical damage loss triggered by one of the insured events as defined in the CBI extension, and affecting one or more of its suppliers or customers, also as defined in the CBI extension.

Figure 1 below is an attempt to represent, in a simplified way, the typical supply and purchase chain, or rather the chain tree, exposed to CBI.



Who is particularly at risk?

The following occupancies/risks, which depend more than others on supply chain systems for their manufacturing activities, are considered to be more exposed to CBI.

- **Suppliers/Customers:** *(differentiated by Tiers 1 and 2 and beyond, and between named in the policy and unnamed)*
 - Automobile/aircraft & ancillary plants
 - Electrical goods manufacturing plants
 - Semiconductor plants
 - Pharmaceutical formulation plants
 - Petrochemical & chemical plants
 - Computer manufacturers
 - Printing industry/newspapers
 - Companies with Just in Time production (lean production)
 - Companies that have outsourced the production of certain components and are dependent on single or quasi-monopolistic suppliers
 - Companies that are dominant market leaders with a quasi-monopolistic character.
- **Public Utilities**
 - Telecommunications companies (telephone and television) IT centers
 - Heavy metal industry (in particular aluminum production)
 - Risks located in industrial parks or complexes and sharing utilities
 - Regions whose power supply is based on a single closed circuit network or branch transmission & distribution line.
- **Denial of Access (Ingress / Egress)**
 - Hotels^(*)
 - High rise risks with a large number of staff^(*)
 - Risks with only one access road or bridge or port
 - Port blockage.
- **General**
 - Risks located in industrial parks or complexes where manufacturing units become suppliers and customers to each other
 - Major risks without an emergency/disaster recovery plan
 - Risks with blanket CBI coverage under a multinational and/or global insurance policy.

CBI catalysts are well known, but an increasingly complex environment makes CBI a multifaceted matter, requiring a comprehensive Enterprise Risk Management approach

As shown in Figure 2, CBI exposures have reached an unprecedented peak level due to a combination of:

- Globalization of production activities;
- Outsourcing of manufacturing activities, often concentrated in natural catastrophe-prone areas;
- "Just in Time" production;
- Complex supply chain systems, inter-connected within and between industry sectors;
- Concentration of suppliers and customers in most sectors.

Supply chain systems can be manageable under normal circumstances, but may become unmanageable when

the system is stressed due to a loss event that is either unexpected in nature or size or is badly managed. Risk and crisis management needs to be engineered, implemented and tested in order to be prepared for risk factors and scenarios affecting critical paths in both normal and stressed conditions. Such preparedness requires:

- Internal risk analysis focusing on critical parts and key products, as well as on single supplier bottleneck risks and dependencies linked to an integrated "Just in Time" approach to the production system;
- External risk analysis related to natural catastrophes and other external man-made events, whether social, political or religious.

^(*) Infectious diseases / communicable illnesses cover triggering only upon "mandatory notification of a public threatening illness or disease as certified by competent public authorities."

The management of complex supply chains raises the importance of building a comprehensive Enterprise Risk Management framework, covering the following:

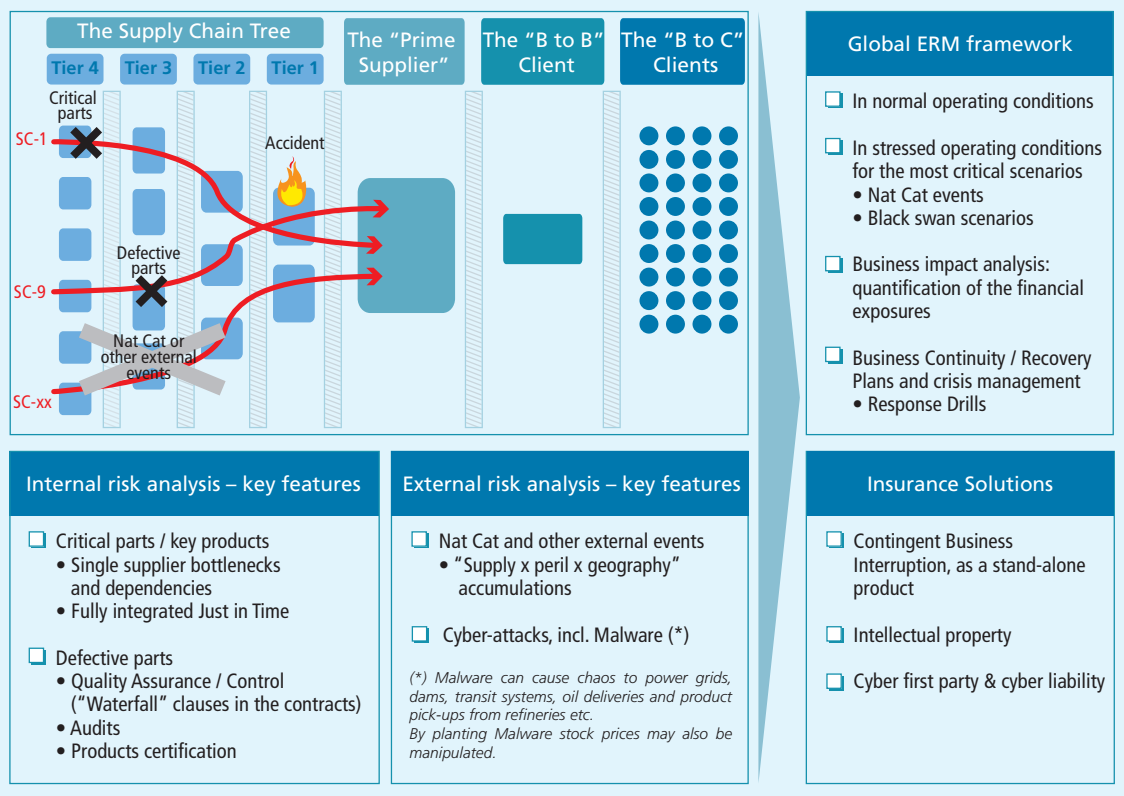
- Normal operating conditions;
- Stressed operating conditions for the most critical scenarios (*natural catastrophe events, infectious diseases / communicable illnesses, political violence, sanctions & embargoes*);
- Business impact analysis: quantification of financial exposures by scenarios;
- Contingency, mitigation, business continuity & recovery and crisis management plans.

Going one step further, not having a thorough Enterprise Risk Management approach might even make CBI claims more complex: there could be other unrelated issues (aside from damage) that prolong

interference to or interruption of the insured's business, such as:

- Severe underinsurance, delays in repairs and reinstatement of plant & machinery at a supplier's or customer's premises, thus further delaying the time when the supplier or customer is able to resume business with the insured;
- Post-loss modifications to plant specifications to operate on cheaper alternative feedstock or catalysts, resulting in the customer no longer wishing to buy from the insured even though the customer's factory is restored and ready to resume production;
- Unsatisfactory pre-loss benchmarking of other similar factory operations to simulate the "as if" scenarios of when exactly a supplier or customer may be able to repair the damage sustained at their factories, thus truncating the indemnity period.

Figure 2: A comprehensive Enterprise Risk Management approach is required



CBI is even more complex if claims handling is not taken into consideration, and specifically addressed by insureds and (re)insurers

From a legal claims handling perspective, CBI risk involves pure third-party cover, insuring supply chain integrity and economic loss. The supplier or customer may not be a subsidiary, affiliate or associate of the insured entity but an independent arms-length supplier or customer.

This poses additional and somewhat unconventional claims handling challenges, as the supplier or customer is a third party to (re)insurers; in most cases it is not an insured entity under the BI policy and it has no legal obligation to disclose its trade information to (re)insurers.

The third party supplier or customer is consequently a party that (re)insurers may not be able to control or influence in the claims adjusting process. This can introduce uncertainty and delays into the claims handling process and may hamper proactive effective decision making in terms of finding alternative ways to reduce the supply chain loss.

As a result, CBI requires tailored claims handling protocols & communication channels that have to be pre-discussed and agreed with the insured at the outset of the policy placement. The insured needs to have agreements in place with its suppliers and customers to disclose sales and production data. Agreed Non-Disclosure Agreements (NDAs) may be required in the event of protected trade secrets: NDAs are notorious for being onerous and can delay the claims handling process.

Key factors are the insured's transparency and co-operation in terms of giving (re)insurers access to any critical or useful information on the entire supplier / customer / interdependency network, including ways

and means of composition. The insured's disclosure of risk-engineered Business Continuity Plans, as part of proper risk underwriting and loss control during the pre-underwriting phase, helps with the design of suitable claims handling strategies to minimize loss and facilitates and accelerates loss adjustment and settlement when a claim does actually arise. Such disclosure also helps to analyze policy coverage (named vs. unnamed, first vs. second tier, direct vs. indirect suppliers and customers), as each policy, being often individually customised in a manuscript form, may have different terms of cover).

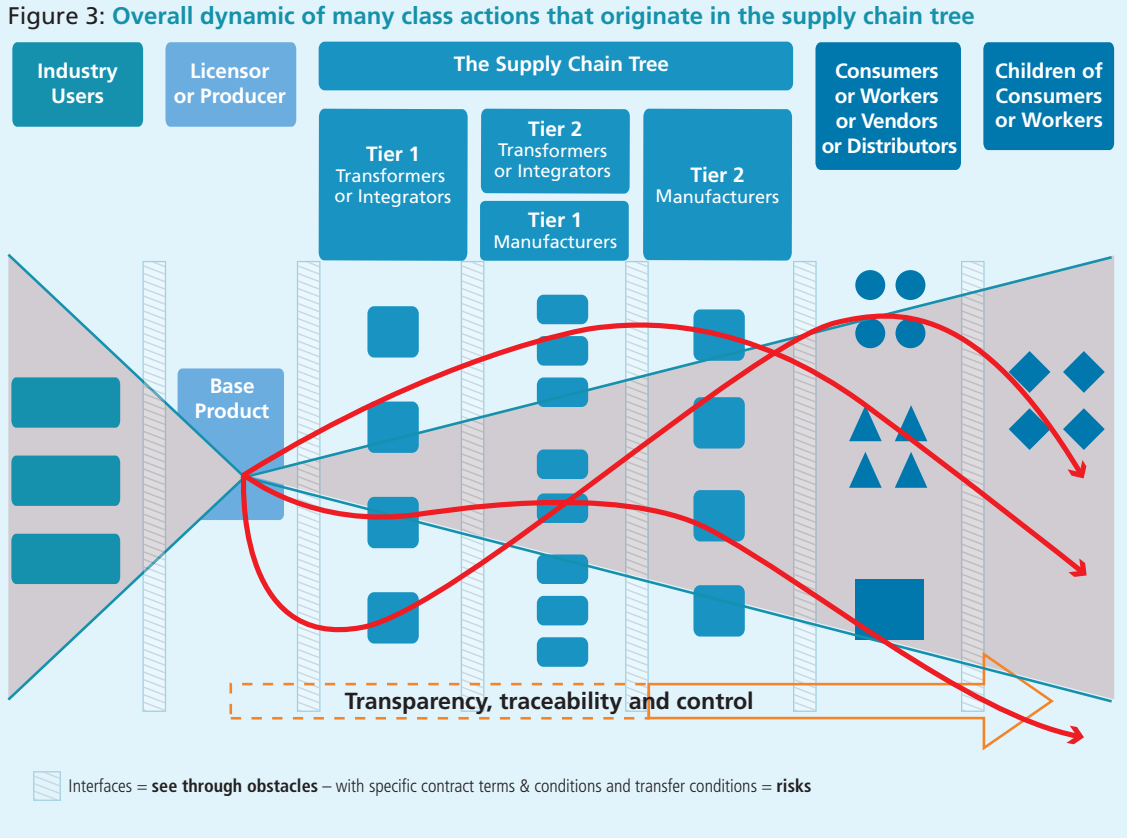
Successful CBI underwriting, which encompasses the provision of effective claims handling, requires a risk engineered approach in order to understand the key CBI exposures of the insured at the pre-underwriting stage.

- The other key issues in CBI adjustment that overlap with traditional BI include: adjustments for market trends, wide area damage, seasonality, material variation in supply and demand in the insured's market segment, or change in business model, temporary price surge and spike, deduction of savings in insured charges and, last but not least, underinsurance.
- CBI claims must be project managed with the key loss adjuster, forensic accountant and business & market analyst named in the insurance policy, who are familiar with the specific niches of the industry in which the insured operates. Claims management must also include the designated persons in the insured's organization (CFO, Production Manager, Finance Manager) who will handle the claim for the insured and be able to make decisions.

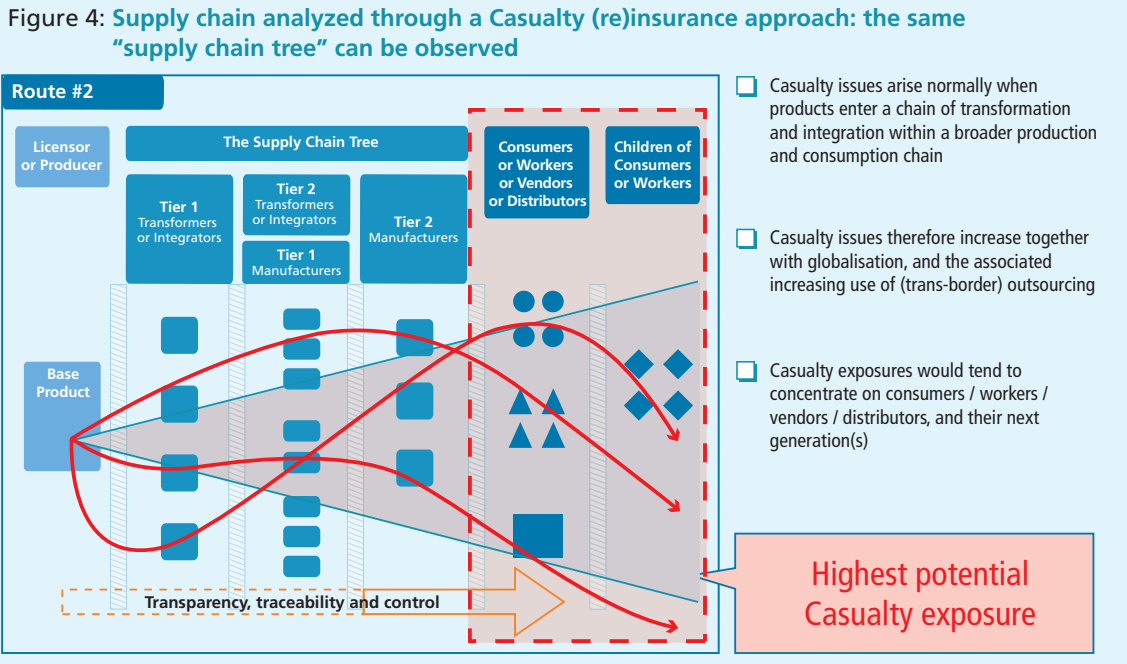
Supply Chain risks: where Property meets Casualty

The whole issue of CBI risk and (re)insurance can be summed up in the three words – "Transparency, Traceability and Control", and the situation is exactly the same for Construction risks (whether transferred through operator or prime contractor-controlled insurance policies) and for Product Liability risks, particularly those prone to class actions.

As base products go through complex manufacturing, transformation and integration chains, product liability claims illustrate the case where supply chain risks encompass both Property and Casualty risks. There are indeed many ways for class actions to originate in the supply chain tree, as shown in Figure 3.



From this perspective, adequately addressing CBI risks enables insureds to mitigate both Property and Casualty risks, and to take a holistic approach to risk management.

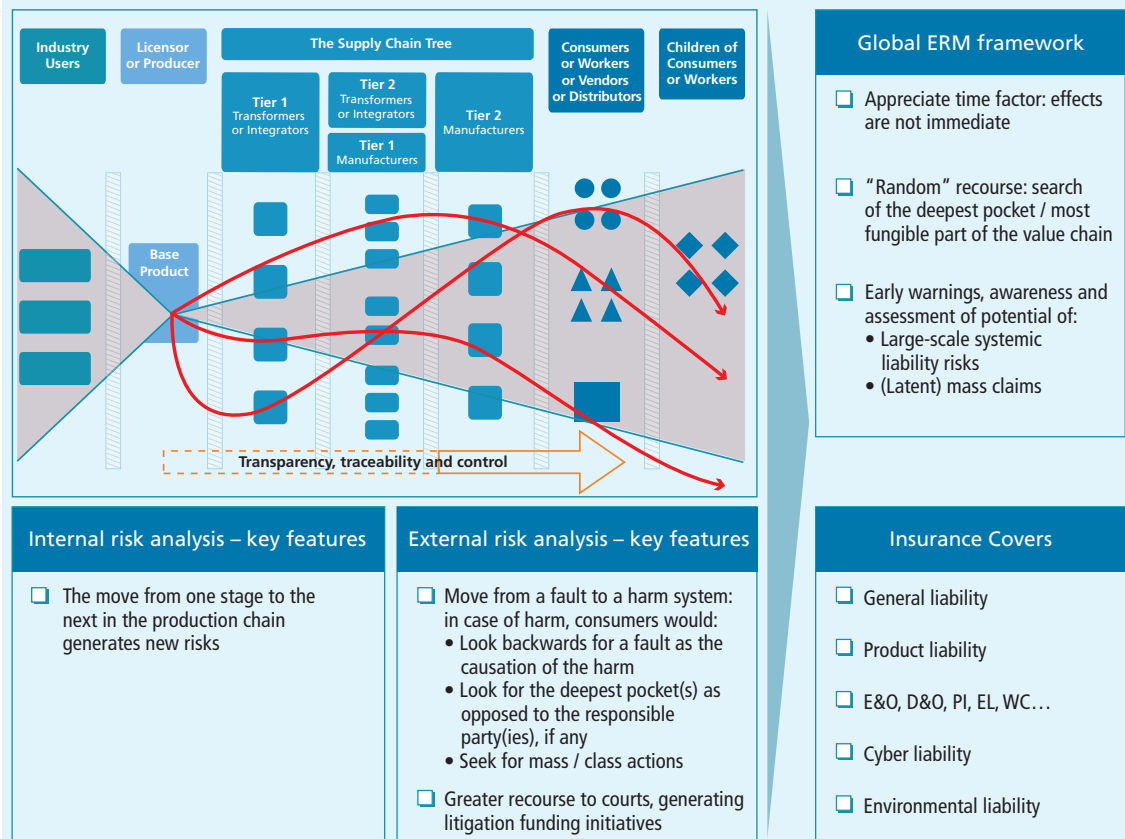


How do you face such a complex risk?

As described above, CBI is in itself a complex matter, compounded by specific claims handling considerations, and combining both Property and Casualty risks. These are key reasons why CBI is a poorly known risk. In

light of such statements, it is up to (re)insurers to take a pro-active role and to lead the way for insureds in terms of their risk management approach, to set best practices and to define investigation areas.

Figure 5: Identifying internal as well as external risks in supply chain trees helps to design efficient ERM frameworks and insurance covers



To conclude, the pre-requisites for finding the right CBI insurance covers are as follows:

- Keep the insureds' needs in mind
 - Overly complex products, with extensive exposure information to be provided and limited effective cover provided, are key impediments
- Simplify & clarify products
 - Simplicity & clarity are what insureds need first
- CBI is insurable: What are the pre-requisites to insurability?
 - Enterprise Risk Management needs to be endorsed and practiced by insureds upstream in the supply chains / trees
 - (Re)insurers have a key role to play in terms of promoting best practices
- Improve product and product management
 - Risk assessment / quantification based on critical scenarios is a pre-requisite for a proper demand and supply relationship:
 - Existence of a shared insured / (re)insurer approach to estimating the extent of exposure, which can be replicated in the event of a loss to be adjusted
 - Avoid unsubstantiated blanket covers
 - Need to investigate further accumulation monitoring / control tools, and apply them fully to cat and cyber risks.

SPEAKERS' BIOGRAPHIES

SCOR SPEAKERS

DENIS KESSLER

Chairman & Chief Executive Officer, SCOR SE



Denis Kessler is a French citizen, he is a graduate of HEC business school (*École des Hautes Études Commerciales*) and holds a PhD in economics as well as advanced degrees in economics and social sciences. He has been Chairman of the *Fédération Française des Sociétés d'Assurance* (FFSA), CEO and Executive Committee member of the AXA Group and Executive Vice-President of the MEDEF (*Mouvement des Entreprises de France*). He joined SCOR as Group Chairman and Chief Executive Officer on 4 November 2002.

VICTOR PEIGNET

Chief Executive Officer, SCOR Global P&C SE



Victor Peignet, Marine & Offshore Engineer graduated from the *École Nationale Supérieure des Techniques Avancées* (ENSTA), joined SCOR's Facultative Department in 1984 from the offshore contracting industry. He has more than 15 years underwriting and managing experience in Energy & Marine insurance with SCOR. He was at the head of the Corporate Business Division of the Group (Business Solutions) since its formation in 2000, as Executive Vice President and as Managing Director from April 2004.

Since July 2005, he has been the Chief Executive Officer of SCOR Global P&C that is one of the two operational entities of the Group and that manages the Group Non-Life business worldwide. He is member of the Group COMEX.

BENJAMIN AURAY

Vice-President Property Automotive Industry Expert, SCOR Global P&C



Benjamin Auray is currently a Vice President, and Senior Property Underwriter, for SCOR Business Solutions, based in New York. He has over 18 years of experience in the insurance and reinsurance industries. Benjamin holds a MBA from *University of San Diego*, C.A. and a Bachelor of Engineering from *Groupe ESIEE* in Paris. He was trained in the field of Highly Protected Risks (HPR) by Kemper Insurance focusing on the high tech and automotive industries. After gaining experience as a Property Facultative Underwriter at AXA Re, he joined SCOR in 2002 in the Paris office. Benjamin was then relocated to New York as a Senior Property Underwriter in 2006. Benjamin was appointed Automotive Industry Expert for SCOR Business Solutions in 2008, responsible for setting the strategic underwriting philosophy for this industry segment across all lines of business globally. He is currently underwriting a variety of Corporate Property risks for SCOR Business Solutions as well as managing a large Commercial Property program business.

MICHEL BLANC

Chief Underwriting Officer, SCOR Asia Pacific



Michel Blanc started with SCOR in 1992 as Facultative Casualty Underwriter in the large risks division. From 1995 to 2000, based in Tokyo as Chief Representative in charge of P&C for Japan and Korea.

Between 2001 and 2005, he worked for SCOR Business Solutions as Underwriting and Planning Manager. From 2005 to 2008, he was appointed Senior Vice President in New York in charge of SCOR US Discontinued Business. Since 2009, he has been Chief Underwriting Officer in charge of P&C Treaty in Asia-Pacific and is based in Singapore.

JONATHAN CLARK

*Head of Business Solutions & Syndicate Claims Management – London
SCOR SE – UK Branch*



Jonathan Clark is Head of SCOR's London based Business Solutions claims team and Claims Management of the Channel Syndicate. He has been a claims professional for over 30 years and has held International executive positions with Crawford and Cunningham. He was claims director at the UK Financial Services Compensation Scheme from 2007 to 2009. Jonathan Clark is a graduate in biochemistry and biochemical engineering from Oxford and London Universities, a Chartered Loss Adjuster and Chartered Insurer. He is current President of the London Business Interruption Association.

MARC GIOVANNETTI

Property Claims Manager, SCOR Global P&C



Marc Giovannetti is currently an Assistant Vice President in Claims. He manages the US Property claims portfolio for SCOR Business Solutions, which are underwritten in New York. He has over 13 years of claims experience in the insurance and reinsurance industries. Marc Giovannetti has handled a wide variety of large complex property risks both domestically and internationally in all industry segments. He holds a JD from Pace University and a Bachelor of Arts, in Economics and Political Science from *Manhattanville College*. Prior to joining SCOR in 2010, Marc was the Head of Property Claims for Swiss Re Corporate Solutions.

MICHEL KRENZER

Onshore Energy Manager, EMEA team, SCOR Global P&C SE



Michel Krenzer has 20 years experience in the insurance sector. After working for Foster Wheeler in Paris as a chemical engineer, he joined UAP Large Corporate Risks division as a loss prevention engineer. He then moved to oil & gas underwriting at Sorema in Paris in 1995. He then moved to London in 1999 to start up a facultative branch office for Sorema before joining SCOR in 2001. He started at SCOR UK as senior energy underwriter and has had various managerial positions within SCOR Business Solutions, the Large Corporate Risks division of SCOR Global P&C. He was appointed onshore energy manager for Paris and London offices in 2009.

DIDIER SCHÜTZ

Risk Control Practice Leader – ARM, SCOR Global P&C SE



Didier started for AXA UAP Kemper Highly Protected Risks (HPR) Company in Paris in 1995, as Loss Prevention field Engineer and Project Engineer for the sprinkler protection of HPR and non-HPR facilities using international standards (NFPA, FM, VDS, APSAD and LPC). He joined SOREMA – Paris in 1998 as Manager of Loss Control Engineering Services, to analyze Petrochemical Risks (onshore / offshore) and Property Risks (Utilities, Industries and High-Tech – Semiconductors Facilities) Worldwide. Didier joined SCOR in 2001 and he is now Risk Control Practice Leader responsible for providing complete engineering services. Education & Specialized Training: NFPA 921 training for Fire and Explosion Investigations (NFPA training program USA), Associate in Risk Management – ARM 54, 55 & 56 in compliance with the Insurance Institute of America program, Fire Protection Engineering training course (HPR concept) at Kemper USA. Member of NFPA Industry Section, Aviation Section, Latin America Section.

GUEST SPEAKERS

CATHERINE GEYMAN

Director, Intersys Ltd



Catherine Geyman is an experienced supply chain risk management consultant having worked most of her career either in-house for a large pharmaceutical company or as an outside resource to a number of firms. She is a founding Director of InterSys Risk, which is part of InterSys Ltd., a U.K.-based risk management and Information Technology consultancy that specializes in risk modelling, customized risk software and disaster recovery solutions.

She also designs and develops specialized risk software tools to support enterprise integration of risk management activities, including the award winning supply chain loss estimation and mapping tool, SCAIR™. She is a Chartered Engineer and is a graduate in Electrical Engineering and Pharmaceutical Engineering.

PROFESSOR DANIEL RALPH

Director of the Centre for Risk Studies



Professor of Operations Research and Academic Director of the Centre for Risk Studies (CRS) at Cambridge Judge Business School; and Director of Studies in Management Studies and Fellow of Churchill College.

Danny received his PhD in 1990 from the University of Wisconsin, Madison. He lectured in the Mathematics & Statistics Department at The University of Melbourne before coming to Cambridge University for a joint appointment in the Engineering Department and Judge Business School in 2000. He co-founded the Centre for Risk Studies in 2009.

Danny's research interests include risk in business decision making, investment and economic equilibrium models for electricity markets, and optimisation methods. He is Editor-in-Chief of *Mathematical Programming (Series B)*.

HARRY ROBERTS

Consultant at Camford Sutton



Harry Roberts is a Chartered Accountant, who prior to entering the loss adjusting profession in 1983 spent 8 years with Touche Ross working in auditing, insolvency and professional standards review (quality control). Shortly after qualifying as a Chartered Loss Adjuster in 1987, Harry joined Ellis & Buckle (now trading as Cunningham Lindsey) as a founder member of their Specialist Adjusting Unit (SAU) where he was a major player in the development of the SAU approach to major and complex losses, particularly those involving Business Interruption. Harry's experience and knowledge of BI wordings has led to him being consulted as an expert on both policy interpretation and quantum issues. He has prepared expert reports in relation to recovery of both insured and uninsured losses within the UK and abroad. He was admitted as a member of the Academy of Experts in 1996.

Harry was President of the Chartered Institute of Loss Adjusters in 2006/7 and was instrumental in the development of its Specialist Interest Group initiative which has served to revitalize and focus CILA activities.

From 1997-2012 Harry was on the Board of Cunningham Lindsey as Director, Technical, Risk & Compliance. In this latter role he was responsible for the company's response to regulation as well as being instrumental on a broader front in the development of the ABI/CILA Regulation Protocol. He continues to act for Cunningham Lindsey as a consultant on the Business Interruption aspect of major loss claims.

Harry is editor of the Ninth edition of 'Riley on Business Interruption Insurance', which is widely acknowledged as the leading authority on BI matters, and which was published in 2012. In addition he was the joint project leader of the recent CILA/III review of BI wordings which advocates revision of current standard wordings to address recurring issues highlighted by claims experience. In this latter guise Harry now provides expert witness, BI policy interpretation, and claims consultancy services in association with Camford Sutton.

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