

## **Part III**

### **Some issues for supply chain managers**



# 6 Views of GVC operators

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The chapters in this volume discuss different types and configurations of global value chains (GVCs). Authors have covered issues of scale and scope, risk, size and proliferation of supply chains – particularly in Asia. Many of these broader concerns look quite different viewed up close to business leaders operating in the thick of specific GVCs. This chapter, by contrast, focuses attention on some key points of interest in supply chains as seen from the perspective of business.<sup>1</sup>

This chapter highlights the key roles of imports, managing inventory, moving products across borders, and outsourcing. It considers the pressures within the supply chain industry for consolidation and future innovation. Finally, it concludes by highlighting some government policies that are especially harmful for the development of global value chains from the viewpoint of supply chain operators and lead business firms.

## 6.1. Different types of chains

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Not every supply chain is the same, of course. Nor is every company involved in supply chains active across the same sets of activities. For example, Li & Fung manages 15,000 suppliers across a wide range of industries in over 40 countries. YCH Group handles not only manufacturing components, but also spare parts for ATM networks in India. Savant Infocomm runs cold storage supply chains for perishable items in India alongside a traditional system that does not require refrigeration and such careful attention to temperature details. All of these diverse tasks require different sets of skills and management activities.

What unites big players, however, is expertise in managing systems, making investments in the individuals who operate these systems, and building up the capacity to explore new options and opportunities for expansion.

## 6.2. Managing inventory

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One of the most important roles for many manufacturing supply chain operators is managing inventory. Because lead companies are increasingly pressing their vendors to manage inventory, this task now falls to suppliers or to the last rungs of the value chain. Keeping inventory low and located at different levels of the chain dramatically increases the flexibility and agility of the supply chain. It also lowers the costs because carrying inventory no longer appears on the company's bottom line. Supply chain operators help by managing inventory flow to ensure that the goods arrive at the right place at exactly the right time.

As an example, YCH Group produces computer kits for assembly into Dell Computers. Approximately 50 different suppliers produce the components that all need to be put together for the production line. When they began this task, it took the company eight hours to pull the stock and put the kits together. However, the time soon fell to four hours. Now, when an order is received, YCH can deliver the kit components to the line for assembly by Dell in just 45 minutes.

However, this requires very precise timing. If any one of the 50 suppliers is late on a delivery, the entire line comes to a halt. Because most of the components are coming from different countries, it requires very close coordination across multiple countries and tight communication with customs officials to be able to deliver on time.

It also requires YCH to provide help in setting up resilience for the supply chain network to ensure that companies have more than one source for critical supplies. This means that if some disaster knocks out a part of the chain, the rest of the network of distribution facilities can take over from elsewhere in the region.

Managing inventory requires a delicate balance between carrying just enough expensive stock to avoid running out, but not too much to burden the balance sheet. There is one other aspect to carrying low inventory, however, that is important to note – it quickly uncovers problems elsewhere in the system. Any internal inefficiency that could be disguised under conditions of high inventory is rapidly exposed with low stocks. If orders are being received late, for instance, it might not be too noticeable when ample items are already sitting on the shelves. If the cupboard is bare, a late order will be glaringly obvious.

### 6.3. Shifting products across borders

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Globally competitive firms like Dow Chemical literally use the world as their platform. They source raw materials from everywhere. Imported components – nearly 70 per cent of their total inventory – are vital to creating the final products. Of the remaining 30 per cent of products that are produced domestically, many also include some imported components or raw materials as well. Without imports, it is not possible to create products for the domestic market or to manufacture exports.

Wind energy provides an excellent example of this kind of globally sourced product. To create huge wind blades, one of Dow's customers requires a specialty product created by Dow. The supply chain for this chemical starts with an oil well somewhere in the North Sea, which is shipped to a refinery in Amsterdam. From there the raw material is shipped to the Dow manufacturing facility in Germany. Afterwards, some is shipped to the Republic of Korea where they do a relatively high distillation process. Then this product is sent to China for formulation where it is packed into small drums and sent to the customer for manufacture into wind blades.

In fact, a major manufacturer like Dow now spends more money on logistics and services than on manufacturing. This is particularly true considering that costs in logistics are not simply the costs of the tankers and trucks, but also the inventory costs, service costs, government requirements, reporting requirements, import duty tariffs, and issues like labeling, materials safety, managing inventory, and so forth.

As a result, a huge payoff for business comes from standardization and optimization in logistics. How can the cycle be shortened? How can inventory be pushed around better and faster? For businesses, it is easier to shift products from one location to another through various operations and touch points while maintaining consistency and standardization in terms of reporting in terms of values, duty, tariffs and so forth. Anything that can be done to reduce costs and improve efficiency in transferring goods across borders would be extremely helpful and welcome.

### 6.4. The role of outsourcing

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One risk for supply chain operators is disintermediation – the possibility that lead firms might decide to cut out the middle man and do things themselves at some point. For instance, Dell Computer could opt to bundle their own computer kits and not rely on

YCH any longer. However, this does already happen in some cases. Carter's, a children's clothing company, does not outsource the entire production of OshKosh B'Gosh clothing to Li & Fung. Instead, only certain aspects of logistics are handed over to Li & Fung.

What pushes a firm to decide when to outsource and when to hang on to production internally? In part it comes down to core competencies. If there is some aspect of the job that is either viewed as a critical competency for the firm to handle in-house or, if the firm believes it can do this aspect better and more cost effectively internally, it will not outsource. If, however, neither condition holds, the task can be handed off to another firm.

The same thing is true for the supply chain operators themselves. If they do not have a core competency for a task, they should also outsource the task to some other firm with better, lower cost options for completing it. It is, after all, just as important for supply chain operators and big manufacturers to be nimble and keep their own costs down. Their shareholders and Wall Street analysts are seeking high returns on investment, which requires them to avoid diverting company performance by insisting on performing non-key tasks in-house.

One aspect that bigger supply chain operators bring to the task, however, is specialized knowledge of markets. For example, Li & Fung work with suppliers not only in well-known parts of China, but increasingly in more distant places. Building up knowledge requires a commitment on the part of the firm to form relationships with firms, local government officials, regional actors and other stakeholders. Such an investment may not be something that lead firms want to make, but rather to outsource to their supply chain operators instead.

## 6.5. Pressures for consolidation

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Building these relationships can be costly and time consuming. As a result, it can be hard for smaller players to invest in such resources. Even within supply chain and logistics operators, there is an increasing push towards consolidation into larger firms.

Not everyone can handle the pressure for lower margins, higher costs and higher demands for service. Many have gone out of business. Li & Fung bought one company every three weeks in 2011, on average, because they found so many opportunities for expansion.

These pressures are also magnified by the needs of some of the largest lead firms. Since it is difficult and costly for them to constantly search for the best firms to work

with on each contract, they prefer to go into partnership with a few large firms that can handle all aspects of their business. Such a strategic partner has incentives to make future investments in making sure both parties are at the forefront of technology and industry. A reliable partner is also more likely to know and understand the needs of the lead firm and to create solutions.

Even with strong partnerships, some of the largest lead firms will struggle to stay competitive. Global competition can be brutal, with significant turnover among firms. New players are emerging all the time, especially now from developing countries.

The pressures for expansion and consolidation throughout the supply chain industry, though, are also being offset to some extent by the entrance of larger numbers of e-commerce players. The barriers to entry in e-commerce are quite low and the industry is set to grow strongly in the future.

### 6.6. The role of transportation

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Global business relies on efficient means of transportation. The exact method of transport depends on the business model. Many of the leading companies use multiple methods – air, rail, road and ships.

For some companies, such as Zara, nearly all shipments are via air. This includes sourcing some products from Asia, shipping via air back to Spain, then returning finished goods via air back to Asia for consumers. Despite expensive shipping costs, Zara remains one of the most profitable clothing retailers in the world. Why do they use air freight every day? Because their business model is all about limited fashion. The time of conceptualization to appearance in the retail store is about six weeks and such a compressed schedule requires products to move via air. For this company though, their obsolescence is nearly zero given their quick response and the fact that they carry almost no inventory costs at all.

If, however, another company were to try to follow a similar model and air freight all their goods without being properly geared up for that, they would be bound to fail. Their logistics costs will be sky high. So, it is important to pick the right transport model for the overall business model.

Express delivery by air freight is frequently used for fast-moving consumer electronics, medical devices and pharmaceutical products, and precision instruments. It is also used

for critical replacement and repair parts, and for samples and late orders. In addition to speed, firms are increasingly using express companies because they can rely on door-to-door delivery systems with careful tracking and monitoring of packages along the way.

However, one challenge that some companies and logistics firms face in using multiple transportation modes is that the management of transportation within government falls to different agencies. As a result, the rules regarding use of road, rail, ship, and air for freight are complex, fragmented, and vary tremendously across different countries.

For example, the World Bank Logistics Index 2012 notes that lead time for imports in Asia alone can vary from 1–4 days, time processing at the border similarly varies from 1–4 days, and physical inspection rates for cargo shipments could be as little as one per cent manual inspection to as high as 35 per cent in India and 31 per cent in Indonesia.

For exports, the same report notes 1–3 days lead time for processing a 40 foot container from point of origin to port of loading. The costs, including agents fees, port, airport or other charges, range from US\$ 178 in Singapore to US\$ 310 in Viet Nam to US\$ 918 in India.

For companies like UPS, managing these differences can be challenging.<sup>2</sup> The daily delivery volume for the company is 16.3 million documents and packages, with 2012 revenue of US\$ 54.1 billion. More than two per cent of global GDP moves around the world in UPS trucks and planes and, if it were independent, the company would have the world's 9<sup>th</sup> largest airline.

## 6.7. Innovation

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Supply chain operators are grappling with labour challenges. Getting sufficient workers with the right set of skills is proving to be difficult. As a result, more of the process is being automated with a higher reliance on information technology.

Singapore is trying to create something new in a “supply chain city.” This is a dedicated, highly automated facility designed by YCH Group for up to 10,000 supply chain experts, professionals and practitioners. It has been designed from the beginning to allow for very flexible operations. For example, it allows firms to manufacture on the spot, change designs, test products, and prepare to scale up if things go well. It also includes a huge automated storage and retrieval system for inventory. The facility encourages the clustering of suppliers in one place. Singapore's Economic Development Board has strongly backed the project.



UPS is also moving into offering supply chain solutions where UPS employees increasingly perform warehousing and manufacturing operations for global companies. As an example, in Singapore, UPS provides repair and servicing of hard disk drives as part of a client firm's worldwide warranty operations. The facility takes advantage of the transportation links already in place for UPS to quickly and smoothly move goods in and out to customers as rapidly as possible.

## 6.8. Harmful government policies

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All of the logistics operators spoke warmly of specific measures taken by some countries to speed up the processing of goods. One such example is bonded logistics parks (BLPs). China makes particularly good use of BLPs. Among other benefits, they allow an on-the-spot refund of taxes due for exports. (Although BLPs are different in different parts of the world – those in India are not the same as those in China.)

But some countries have implemented policies that make it difficult for companies to locate inventory domestically. To return to the example of the Dell computer assembly for a moment, although most of the components are delivered just-in-time for assembly, it can be critical to have some inventory on hand, as well as spare parts. But a variety of policies can make it impossible for Dell or YCH to locate such a facility in some domestic jurisdictions.

Equally problematic can be policies that create extra challenges to servicing equipment. In many places, domestic rules make it too costly to allow a proper third-party repair hub to operate outside the country and allow products to flow easily across borders. This means that firms must set up suboptimal domestic repair operations, resulting in higher servicing costs for consumers and firms.

Other rules can make it hard for firms to operate in value chains. For example, lead firms may start operating in a market as a joint venture. If the business is successful, the lead firm may decide to take over the business from the joint venture partner. Even if the transition is entirely amicable between firms, government regulations could turn this into a nightmare. Customs officials may now regard the company as a “non-trusted company” in the same category as a new importer and subject to 100 per cent inspections, higher guarantees, and so forth.

Other problematic rules conflict with the value chain pressures to push inventory to suppliers. Lead firms may want suppliers to hold inventory. But in many territories,

suppliers cannot hold inventory unless they are resident companies, as there are no provisions for non-resident importers. This could require suppliers to do all sorts of contortions to satisfy the domestic requirements that are not desirable from the perspective of a global value chain.

YCH has had to develop a creative solution to this problem in India. They are now allowed to represent suppliers that do not have a physical presence in India. The company underwrites the inventory, takes part of the license, brings the shipments into the country, and transfers the product to the manufacturer on a just-in-time basis.

Global value chains have been promoted as one way that countries can pursue economic development. This is especially true since most developing countries rely heavily on small and medium enterprises (SMEs), rather than on large firms. SMEs, even from developing countries, are often seen as important actors in a global supply chain in providing parts and components, for example.

However, one particular challenge for SME participation comes from the pressures of lead firms to push inventory costs down on the suppliers. For larger firms or those with secure financing, the costs of holding inventory might be manageable. For SMEs, these costs are prohibitive.

Imagine that you are being asked to hold a US\$ 1 million in inventory. This has to be held for a full month, plus the time it takes for the order to be delivered. It could also take another 60–75 days to be paid for this delivery. This leaves the company with no cash flow for several months and several million tied up in inventory. Solving this problem requires some creative thinking on the part of governments and financial institutions.

Another set of business obstacles comes from incompatible regulations and standards. Distribution centers currently need to carry two different sets of pallets – one for Europe and one standard size. If you want to ship products from Asia to the Russian Federation and on to Europe via rail, it needs to change cargos three times. Why? Because the rail width is different. Each change adds significantly to the cost and complexity of moving goods.

One bright spot is the creation of data messaging protocols for air freight. This will allow any airline transporting cargo to know exactly what data has been transmitted and ensure the quality of that data. It will also help secure the supply chain by limiting the handoffs or touch points along the chain. The buy-in for the program so far has

been limited, particularly to countries that are technologically savvy. But, should the program spread in the future, the benefits could be significant.

## 6.9. The importance of global free trade

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Not surprisingly, top supply chain and lead manufacturing firms believe passionately in the importance of maintaining free and open trade. The dream for many is to have the ability to source, ship and sell products in the most efficient locations, and to do so as seamlessly as possible. Falling transport and communications costs have made it easier than ever for companies to participate in a global economy.

Supply chain operators can be extremely creative, inventive problem solvers. They manage to bring together suppliers and lead firms from far-flung regions across the globe. Many persevere in the face of difficult obstacles, including a wide variety of policies that stand in the way of the smooth movement of goods.

One important lesson business leaders recognize is the need for continuous engagement with government policymakers. Without regular feedback and conversations with the policy community, neither side may be entirely aware of the obstacles faced by the other. Dialogues on global value chains can be one important mechanism for getting diverse groups to talk openly about key issues — and lead to better policy results.

## Endnotes

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**1** These points were raised during the conference held in Singapore, November 28–30, 2012. The key business contributors were: Dr. Victor Fung, Chairman, Fung Global Institute; Patrick Ho, Dow Chemical; Joseph Phi, President LF Logistics; Gopinath Pillai, Executive Chairman, Savant Infocomm; and Robert Yap, Chairman and CEO, YCH Group. Additional comments were raised by other participants at the conference, sponsored by the Temasek Foundation, the World Trade Organization and the Fung Global Institute. For further information on the conference itself, see [www.tfctn.org](http://www.tfctn.org).

**2** UPS information from Shiumei Lin, Director, Public Affairs, UPS Singapore, February 21, 2013.



# 7 The dynamics of global supply chains

## *The imperatives for success in a new market ecology*

Henry Birdseye Weil

### 7.1. A dynamic perspective is essential

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Supply chains define the flow of goods and services from basic raw materials to finished products and solutions for end users. They have been characterized in terms of both their architecture and objectives. Fine (2005) and Pipenbrock (2009) differentiate between modular and integral supply chains. They state: “modular supply chains consist of relatively flexible and interchangeable relationships among suppliers, customers, and partners. By contrast, integral architectures typically link subsystems with tightly coordinated relationships and distinctive or unique features that cannot be easily connected to other systems.”<sup>1</sup> This typology is illustrated in Figure 7.1.

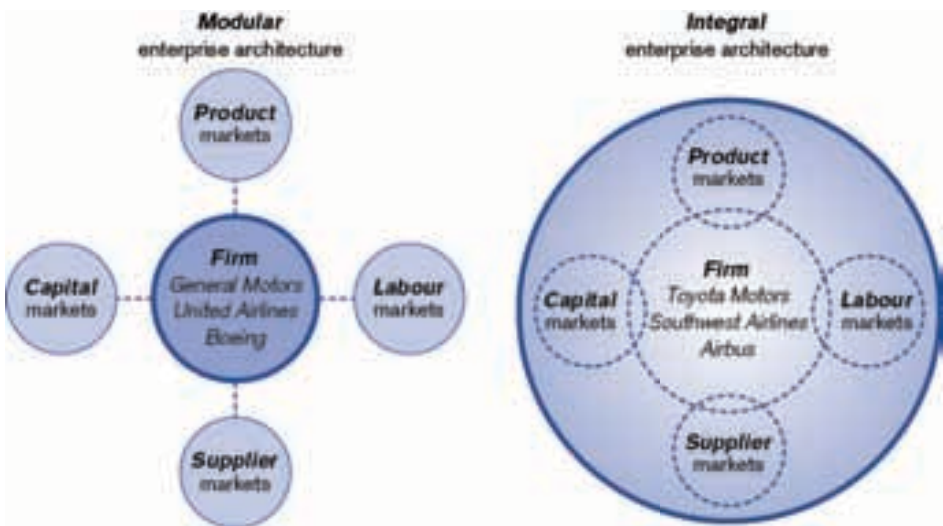
A typology of supply chains also can be based on their strategic objective. In other words: “in market strategy space this can be thought of as Michael Porter’s generic strategies of differentiation and cost leadership. We refer to these distinctions as either ‘Higher, Faster, Farther’ (which refer to competition based on product performance) and ‘Better, Faster, Cheaper’ (which refer to competition on the basis of quality, delivery, and cost).”<sup>2</sup> Supply chain objectives include:<sup>3</sup>

- Cost minimization – buyer-driven, high volume of consumer goods, intense cost/price competition, tight margins, low technology
- Mass customization – buyer-driven, high volume but higher margins, cost/price competition but elements of market segmentation, higher technology
- Product differentiation – producer-driven, lower volume, higher margins, speed less important, technology and proprietary knowledge key for segmentation, and

- Natural resource exploitation – producer driven, highly affected by exogenous factors, capital intensive, cyclical margins, process technology critical

These characterizations are quite valuable but incomplete. First, they tend to be linear and unidirectional, emphasizing the physical flows. Also important are the financial and information flows associated with a supply chain, including payments and customer preferences. These flows often go “upstream” from customers to sourcing agents, manufacturers and designers. Second, there is a value system associated with the supply chain that describes where and how value is created and captured. What value do design, sourcing, manufacturing, logistics, wholesaling, branding and retailing create? What elements of the supply chain capture most of the value and what is their business model?

FIGURE 7.1: A typology of enterprise architectures



<b>Singular</b> (Maximization of <i>Shareholder Value</i> )	<b>Objective function</b>	<b>Plural</b> (Maximization of <i>Stakeholder Surplus</i> )
<b>Narrow</b> ( <i>narrow spatial, short temporal</i> )	<b>Enterprise boundaries</b>	<b>Broad</b> ( <i>broad spatial, long temporal</i> )
<b>Simple</b> ( <i>High</i> quantity of participants in a stakeholder class, <i>Low</i> quality of stakeholder relationships)	<b>Stakeholder interfaces</b>	<b>Complex</b> ( <i>Low</i> quantity of participants in a stakeholder class, <i>High</i> quality of stakeholder relationships)

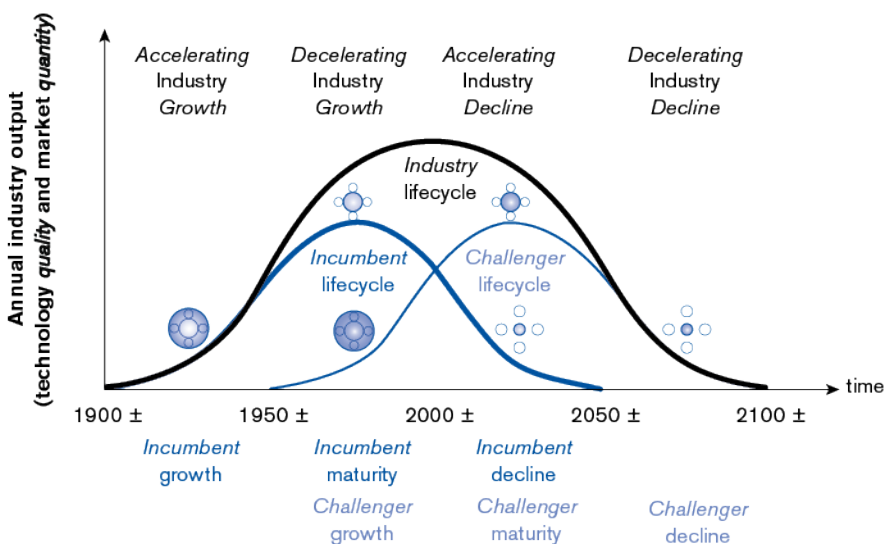
Source: Pienbrock (2009).

Finally, supply chains have become highly dynamic. Their architecture and operations are changing continually, at an accelerating pace. As Fine et al., (2002) observed: “competitive advantage is, at best, a fleeting commodity that must be won again and again. That requires continual disintegration and reintegration of organizations, with frequent reshuffling of structural, technological, financial and human assets, as every player in the value chain seeks some sort of temporary competitive advantage. A company’s real core capability – perhaps its only sustainable one – is its ability to design and redesign its value chain in order to continually find sources of maximum, albeit temporary, advantage.”

Pipenbrock (2009) builds on Fine’s work. He presents a dynamic model of the evolution of business ecosystems, i.e., supply chains and their associated value systems. Thus: “enterprise architectures early in the industry’s evolution are integral, for radical product innovation. They then disintegrate for speed to build a fast-growing market, and for greater cost-leadership and more modest product innovation. As the ecosystem begins to mature, integral enterprise architectures are required for radical process innovation.”<sup>4</sup> This scenario is shown in Figure 7.2.

Today, supply chains typically extend from low cost manufacturing and assembly locations in developing countries such as China to end users in Europe, North

**FIGURE 7.2: Evolution of business ecosystems**

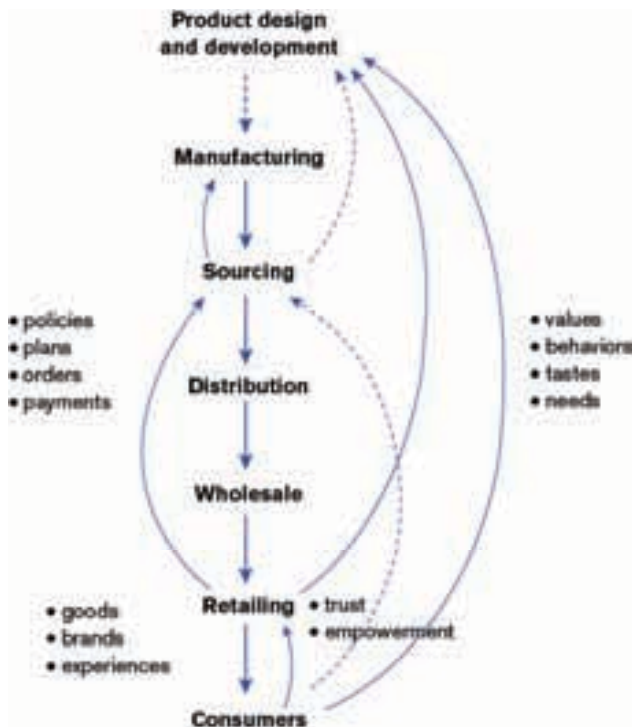


Source: Pipenbrock (2009).

America and the Pacific Rim. Some are bi-directional with sophisticated high-value components manufactured in a developed country and sent to a low-cost locale for assembly. A simplified diagram of the principal elements is shown in Figure 7.3.

The “sweet spot” in a supply chain is the set of activities where a significant amount of value is created and captured, Fine et al., (2002) provide a very useful framework for identifying and managing these activities, stating “to complement the traditional tool of economic value-added (EVA) analysis, which provides a quantitative financial value, we developed a strategic value assessment (SVA) model that adds a qualitative component to the evaluation and decision-making process. Combining the economic and strategic value analyses enables us to classify key elements of the value chain as having both high economic and strategic value (likely insourcing candidates); both low economic and strategic value (likely outsourcing candidates); high economic and low strategic value (potential to harvest assets); or high strategic but low economic value (potential for future leverage).”<sup>5</sup> Their model is presented in Figure 7.4.

**FIGURE 7.3: A typical supply chain**



Source: Author.



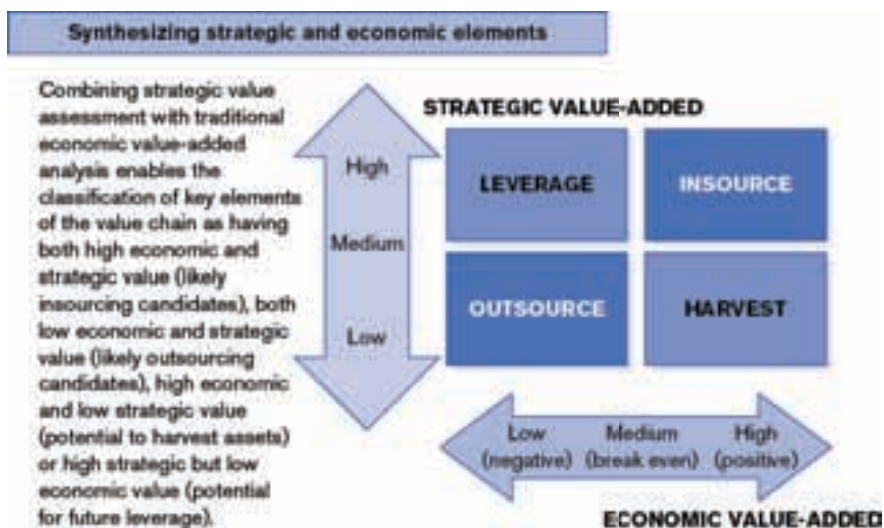
Sourcing once was the sweet spot. This is an agency business where intermediaries such as Li and Fung orchestrate the supply chain to link suppliers with distributors and retailers. Their objective is a blend of cost minimization and mass customization. But sourcing is becoming commoditized. It is moving into the upper left quadrant of the matrix in Figure 7.4.

Sourcing may anchor an intermediary's relationship with clients but now the strategic objective is to leverage sourcing to provide additional services with greater economic and strategic value-added. The sweet spots in the value system have become design, retailing, and brands. They fall in the upper right quadrant. Some supply chain members who specialized in sourcing are expanding aggressively in those areas. Thus, "in today's business environment organizations whose supply chain efforts are only confined to operating cost reduction are likely to be left behind the competition."<sup>6</sup>

While the sweet spots in the value system are changing, it is essential to recognize that products and services play differentiated roles in a customer relationship.

- Magnetic – attracts the customer
- Anchor – holds the customer
- Profit engine – makes the relationship pay, and
- Spice – supports the brand, the customer experience

FIGURE 7.4: Assessing strategic value



Source: Fine et al., (2002).

The differentiated roles can be seen in retail banking. Mortgages tend to be the magnetic product. Customers are most likely to change banks in order to get a good deal on a mortgage. The banking relationship is anchored by the current account. Unsecured lending, as with an overdraft or debit card balance, is the profit engine. Further, mobile banking supports a bank's image as an innovator and provides opportunities for differentiation.

The same differentiated roles exist in supply chains. Often sourcing brings new clients to an intermediary and sourcing plus logistics anchor the relationship. "Onshore" services such as distribution, wholesaling and retailing have become the principal sources of value and growth, while product design and development are the spice. In the future, deep market knowledge of China and India will attract new clients. Managing supply chain sustainability and integrity is likely to be an important relationship anchor. Finance and e-commerce platforms will be key profit engines, while brands and risk management will be fertile ground for innovation.

Requiring each element of supply chain service to justify itself as a profit centre is a dangerous oversimplification. The customer relationship should be the profit centre. The services that play the key roles change over time as the relationship matures and the customer's situation evolves. Customers, in the context of relationships, determine the value of individual services.

Dramatic changes in supply chain architectures and objectives and their associated value systems are underway. Possible future architectures include:

- Changes in the Chinese supply base, e.g., far more sophisticated and sustainable
- Manufacture in Asia to sell in Asia, e.g., China is a huge domestic market
- Nearshoring, e.g., manufacturing in Mexico for the US market
- Manufacture to order, e.g., very flexible and rapid supply chains, and
- Adding value close to customers, e.g., final assembly and finishing.

Government policies and regulations are a very significant part of the business landscape and will influence future supply chain architectures and objectives. Inconsistencies across jurisdictions incentivize regulatory arbitrage. Government policies clearly impact the magnitude and accessibility of market opportunities as through barriers to entry,

regulation of competition, procurement practices and the advocacy of particular technologies. Government policies affect the dynamics of product, service and business model innovation. As observed by Klepper and Graddy (1990), Lyneis (1993) and Milling (1996), governments can drive the virtuous dynamics by reducing the risks for other participants, such as through the establishment of standards, protection of intellectual property, being a lead user of innovative technology, tax incentives for risky investments and making markets more open, transparent and efficient.

There is a circular relationship between government policies and regulations and market conditions. Sometimes regulations shape the market but often they respond, e.g., to incidents regarding product or process safety, personal privacy, and environmental impact. Grösser (2011) found that building codes formalized what already was standard practice for energy efficiency.

## 7.2. The business landscape is changing

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The business landscape is changing rapidly and, in many respects, discontinuously. Supply chains face significant disruptions in the markets where they operate and an inflection point for the sources of value and growth. Many factors are combining to reshape supply chains and their associated value systems. These dynamics are connected. They reinforce and accelerate one another. The principal drivers of change are:

- Adoption and commoditization of broadband
- Innovations in media and e-commerce
- Increased market transparency
- Deconstruction of integrated value chains
- A discontinuity in consumer aspirations and use of technology
- The Foxconn effect, and
- China becoming a vibrant domestic market

Ubiquitous, very-low-cost broadband connectivity is disrupting and reshaping how products and services are packaged, marketed, delivered and used. It changes the social dynamics of markets, creates the new economics of information, enables

deconstruction of integrated value chains, stimulates innovation and accelerates the commoditization of many products and services. It offers exciting new opportunities to established companies while posing major threats to their strategies, business models and cultures.

The new economics of information are changing the way content is generated and distributed and the way supply chain members communicate with one another.<sup>7</sup> Traditionally, the economics of information were based on several simple laws. The first law was the tradeoff between reach and richness. You could reach a huge audience with a simple, undifferentiated message such as a television advertisement, or you could deliver a complex, personalized message to a very small audience, as in a salesman talking one-on-one to a potential customer. The Internet eliminates this tradeoff. Rich messages can be sent in a highly personalized form to large audiences. Many small audiences are as good as one large audience, maybe better.

The second law was economies of scale in broadcasting. The larger the audience reached, the lower the cost per message. That, too, has been changed by the Internet. Now the cost per message can be constant, and very low, independent of the size of the audience reached. Thus, "...the more end-users a network has, the more valuable the network becomes to the users. Metcalf's Law, named after the founder of 3Com and father of Ethernet, states that the potential value of a network is proportional to the square of the number of connections."<sup>8</sup>

The third law was diminishing returns to scale. Unit costs would not decline indefinitely with size. Beyond a certain point they would become constant or even rise because of bureaucracy and complexity. In the world of digital media and e-commerce, the cost per transaction can be essentially zero. Instead of driving up costs and reducing the profitability of a relationship, today the rule has become the more transactions you have with a customer, the better. Very frequent contacts are essential for building brand value, customer satisfaction, trust and sticky relationships. The world is changing, as "...web services are breaking down barriers between disparate systems, organizations and creating webs of new relationships. Value chains are today being 'blown to bits' as Phil Evans of the Boston Consulting Group described in his book by that title."<sup>9</sup>

The shift from closed proprietary networks to the Internet is a very important development. The Internet is the antithesis of walled garden systems where customers are restricted to a pre-determined range of products and services. It inevitably leads to greater customer independence. Some supply chain functions like sourcing are

vulnerable to disintermediation. E-commerce makes it easy for customers to deal directly with manufacturers, markets, and one another. Other functions such as retailing face intermediation by aggregators such as Google and Baidu who challenge them for the customer relationship. These developments are disrupting established patterns of influence, control, value creation, and value capture in supply chains.

The next wave of disruptive innovations includes mobile broadband, smart phones like the Apple iPhone and “web 2.0”. What is happening in media shows the future of retailing. Both markets are shifting from a traditional hub-and-spoke structure to a much more complex decentralized grid architecture. Much of the innovation is occurring in the peer-to-peer (P2P) context, as with Facebook, Groupon, Svvply, Vent Priveé and Gilt Groupe. An increasing amount of the innovative software is open source, e.g., Android. Applications and content are becoming web-based rather than residing on “fat” clients such as PCs and local servers.

This new environment must be thought of as more than a technological phenomenon. It also is a major social phenomenon characterized by an explosion of self-expression and viral content, cloud computing and large-scale piracy of intellectual property (IP). The emergence of personal media, social networks and virtual communities is especially significant. It will be increasingly difficult to maintain control over IP. Forward-thinking companies are considering where to go “open source.” The new social ecosystems have powerful network effects. They can drive the emergence of dominant standards and for next-generation platforms and supply chains.

Increasing market openness and the new economics of information create a very different ecology. It is far more transparent, competitive and unforgiving. An ever-greater number of customers will find out who has the best service, technology and prices, who treats customers well and who does not. If you are not one of the best, you will find it more and more difficult to attract and retain high-value customers. The competition will be intense and unavoidable. As they say in the US: “you can run but you can’t hide!”

### 7.3. The changes are disruptive

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Each of the drivers of change is quite significant. The combination is highly disruptive. The situation at Foxconn put the global spotlight on workplace conditions in China and other low-cost manufacturing locations. The effect is unfolding in three waves – immediate, near term, and mid term. It already has precipitated rapid increases in unit labour costs that are spreading from China to other countries. This produced

strong pressures to improve productivity and/or relocate factories. In the mid term, the resulting surge in disposable income and consumption will offer exciting new opportunities for retailers, brands and supply chain members.

Innovations in media and e-commerce have dramatically increased market transparency. News travels quickly through blogs, social networks and Twitter. There is no place to hide when something goes wrong. BP's incident in the Gulf of Mexico wiped 55 per cent off its market capitalization in a matter of weeks and badly damaged its reputation. Foxconn has made sustainability a priority issue among consumers, retailers and brand owners. They, and inescapably supply chain members, face much greater reputational risk and financial liability with respect to product safety.

A holistic, end-to-end approach to supply chain sustainability is essential. It is clear that "some leading companies have already suffered reputational and brand damage when problems have been uncovered, even if they are not contracted to the offending supplier. Consumers will not understand the contractual complexities, only that a brand is associated with unethical practices."<sup>10</sup>

Increased market transparency also intensifies competition. Innovative information aggregators like RedLaser and GoodGuide facilitate comparison shopping by both B2C and B2B buyers. Others like Panjiva make it easier for retailers to connect directly with manufacturers. The risks of disintermediation, of retailers going direct to manufacturers and manufacturers going direct to consumers, are significant. Greater transparency enables deconstruction of the value chain and entry of new competitors who attack the sweet spot and commoditize it.

The most likely result is margin squeeze for intermediaries and commoditization of traditional sourcing services based on the agency business model. Intermediaries are caught between higher product costs and customers facing weak markets who are unwilling to accept cost increases. Greater customer power, with Wal-Mart as the extreme example, amplifies this problem. The sweet spot in the value chain is shifting toward the customers to wholesale, retail and brands.

A generational discontinuity, especially in China, is reshaping the business landscape. The "under-30s" are dramatically different from their parents in their aspirations, attitudes toward consumption and use of technology. They are always connected to their friends and acquaintances through mobile phones, Twitter and Facebook. They have a voracious appetite for digital media. They are driving the explosion of social networks, media, and commerce through companies like YouTube, Groupon, Vent

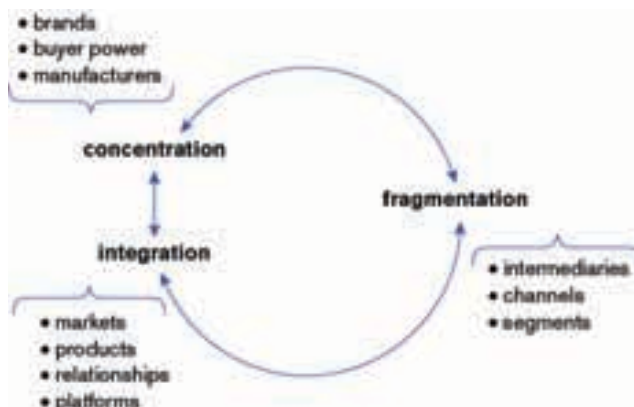
Privée and Gilt Group. These young people expect to have a much better life than their parents and want the material trappings of success as soon as possible.

China is in many respects the biggest and most elusive prize. The country is transitioning from primarily a centre of low cost export manufacturing to a large and rapidly growing domestic market. Asian investors are acquiring high-end western brands such as Jaguar, Hickey Freeman, MCM, Pringle, Hardy Amies and Gieves & Hawkes, in large part to address this emerging opportunity. The next step will be to develop global products, brands, and creative leaders in China. But China needs to turn “made in China” from a negative into a plus. The problem is similar to “made in Japan” 50 years ago – perceptions and reality of low quality, oppressive “sweat shops”, endless product safety scandals and rampant forgery of brands.

## 7.4. Value systems are dynamic

Supply chains and their associated value systems will be complex and defy simple descriptions. They will be simultaneously concentrated (at the manufacturing level and for buyer power and brands), fragmented (many new types of channels, intermediaries, and segments) and integrated (in terms of markets, products, customer relationships, and e-commerce platforms). And as described by Fine (1998) the balance among concentration, fragmentation, and integration is dynamic. In the short term, integrated value chains will be unbundled, attacked and commoditized. Then a new wave of innovations will drive re-bundling and de-commoditization. These dynamics are shown in Figure 7.5.

FIGURE 7.5: Dynamics of the value system



Source: Author.

Value systems tend to cycle between vertical and horizontal integration and between concentration and fragmentation. The period of these cycles depends on the “clock speed” of change in a particular market or industry.<sup>11</sup> Utterback (1994) and Weil and Utterback (2005) link the dynamics to the evolution of a generation of technology or business models. The entry of firms into a market and the subsequent exit of many or most competitors are central to the dynamics of innovation. In fact, “the advent of the dominant design marks a shakeout period which will see a greatly reduced number of firms and product variants. This condition will generally persist until the next technological discontinuity.”<sup>12</sup>

There are two immediate consequences of the dynamics. The most profitable elements of the value system are exposed to competitive attack and new forms of intermediation and aggregation are challenging established relationships. The most profitable elements of the value chain are being attacked in several ways. Major players in adjacent industries, including large logistics companies such as FedEx, see the opportunities and target them. New entrants like Alibaba also focus on these particularly attractive elements of the value chain. Fragmentation of the value chain stimulates new forms of intermediation and aggregation, which further decompose it and add complexity.

Consider what is happening in retailing:

- Aggregators use the buying power of a large group of customers, e.g., Groupon
- Infomediaries help customers find the best products and prices, e.g., RedLaser, GoodGuide
- Exchanges bring buyers and sellers together, e.g., eBay, Alibaba.
- Integrators link products, services, and content into a complete solution, e.g., Gilt Group, Net-a-Porter.

As shown in Figure 7.6 the combination of value system fragmentation, targeting the traditionally profitable elements, and new forms of intermediation are having profound impacts: shifting power to consumers and their agents and accelerating commoditization of the value chain.

Basic supply chain functions, and in particular sourcing and distribution, risk becoming completely commoditized. Innovative product, service and content integration, the



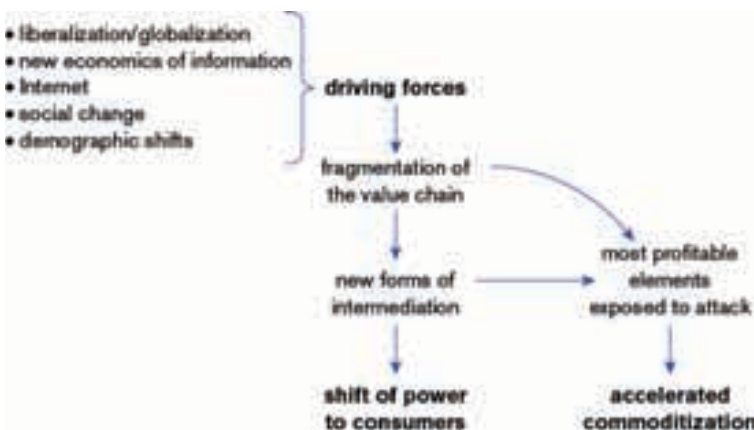
use of information and relationship models have become the principal sources of differentiation and value added. It is clear that “extracting value from IT requires innovations in business practices. Companies that mechanically insert IT into their businesses without changing their practices for exploiting the new capabilities will only destroy IT’s economic value.”<sup>13</sup>

Commoditization is often the unintended result of intense competition. But it also can be a deliberate strategy. There is nothing new about this. Gillette priced its razors very cheaply in order to lock in customers to its blades, which were highly profitable. Kodak did the same with cameras in order to sell film and processing. HP follows a similar strategy with printers, as do Sony with DVD players and Apple with the iPad. The hardware is a platform for selling other products, content and applications. This strategy requires a supply chain that can deliver the hardware at a very low cost because of significant economies of scale.

Sometimes elements of service are commoditized in order to eliminate barriers to entry and sell complementary, highly value-added services. Google monetizes free search through advertising fees, Ryanair charges very low fares for transport and makes its profits from other services and Alibaba commoditizes sourcing while providing high-margin finance. Market intelligence may be used to acquire and anchor customers for other supply chain services.

In this ecology the quick will defeat the big. The ultimate winners will be the few companies capable of moving quickly. It will be necessary to travel light – the less

**FIGURE 7.6: Destruction of the existing value chain**



Source: Author.

legacy baggage, the better. Rapid decision making will be essential. There will be no time for elegant, optimal decisions. Fast but good decisions must be accepted. Thus winners will be determined by corporate culture, internal business processes and organizational structure. In other words, “every company will face a confluence of internal and external forces, often unanticipated, that will conspire to make an existing business strategy unviable.”<sup>14</sup>

## 7.5. Trust is central in the new ecology

Trust plays a central role in the dynamics of supply chains. It determines what you can do with information, i.e., observe, capture, analyse and use it to create value. Customer information becomes the most valuable asset, especially in commoditized markets. Trust is the essential prerequisite for the customer to reveal sensitive information, authorize use of this information and welcome the results. In the absence of sufficient trust, likely customer behaviours are deliberate deception, holding back and fending off.

Trust is built through serving customers better as with segmenting the market, personalizing relationships and customizing solutions. Customer information management drives a dynamic model of relationship value. The model involves extremely powerful self-reinforcing mechanisms, which can be either virtuous or vicious. Growing satisfaction and trust leads the customer to be more open regarding values and needs and more willing to empower the provider. As an empowered agent the provider can search, evaluate, advise and implement on behalf of the customer. This “learn more, serve better” model is shown in Figure 7.7. It is central to value creation in content markets. Trust is built over time through a series of great customer experiences.

Proactively demonstrating trustworthiness and accelerating development of trust-based relationships are top priority for a service provider. In an article on customer

**FIGURE 7.7: A model of relationship value**



Source: Author.

relationship management Weil and Weil (2001) argue quite emphatically that trust is the prerequisite to empowerment. Customers must empower a service provider in order for the provider to serve them better and build more value in the relationship for both parties. Being proactive accelerates the creation and realization of this value. The specifics of the journey will be different across the customer segments. The principal issues pertain to privacy and security of sensitive information.

Trust, empowerment, and “win-win” with the customer should be at the heart of a supply chain strategy. While any participant in a supply chain could take the initiative to build trust-based relationships, intermediaries are usually best placed to do so. They need to win the trust of both their customers, i.e., retailers and brand owners, and the factories that supply them. A high level of mutual trust is a key aspect of the integral supply chain architecture described above. A trusted intermediary can orchestrate a complex ecosystem of manufacturers, service providers, retailers and brand owners, but in many instances their customers define the objectives of the supply chain. Power and influence have shifted to retailers, brands and owners of IP.

It will be a challenging ecology for consumers, too. Most will have fragmented relationships with product and service providers, creating a major opportunity for intermediaries to put the pieces together into a complete picture and make sense of it. They will face new dangers of theft, fraud, misuse of personal information and invasion of privacy. Consumers will have to contend with overwhelming choice and they, not providers, will define quality, relevance and value. Trust will be essential; brand will be key.

The winners in the new ecology will manage relationships to build trust and intimacy, and use customer information to provide solutions which are relevant, welcome, valued and acted on. Sustainable competitive advantage will come from intangible factors, including customer insights, special skills and capabilities, brands, reputation, relationships with suppliers and customers, trust and the “customer experience.”<sup>15</sup> Achieving a unified approach to and relationship with customers is essential.

The successful companies will understand how to build relationships with Internet-fluent, frustrated, cynical and mistrustful people. These companies will be trusted because the agency relationship will be unambiguous: they work for the customer. The winners will exploit their major competitors' most vulnerable “loose bricks,” i.e., where they are behaving in insensitive, condescending, self-serving and exploitative ways – or worse. Their emotional appeal and relationship proposition will be their key differentiators.

## 7.6. The need for change is imminent

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Supply chain members must contend with a set of complex, interrelated strategic issues:

- Greater bi-directionality as in bringing products to developing markets, handling e-commerce returns, recycling products at the end of their lives
- Serving domestic markets as well as exports, addressing the explosive demand for goods and services in China, India, and other markets
- Major changes in where and how value is created and captured as through product design, development of powerful brands, and e-commerce
- Where innovation occurs and its character, for example: China becoming a hotbed of creativity, innovation around customer experiences and other intangibles
- Integrated versus specialist business models – anticipating cycles in supply chain architectures and their associated value system
- Off-shoring versus near-shoring as with increased importance of regional supply chains, emphasis on adding value close to customers
- Achieving and maintaining supply chain integrity such as building trust, turning “made in China” from a negative into a plus, and
- New business models including close follower to demand trends, produce to order, rapid production scale-up and integrated end-to-end solutions

The imperatives for success in this new market ecology begin with greater coordination among supply chain members. There are many opportunities to create value through collaboration and information sharing and to combine capabilities and information in ways that serve customers better. This will require relationships within supply chains to become far more “integral” as defined by Fine (2005) and Pipenbrock (2009). The culture of most supply chains is distinctly entrepreneurial. An entrepreneurial culture is inherently competitive for opportunities, resources, recognition and rewards. Entrepreneurs must be convinced that collaboration and sharing generate greater value and that they will get a fair share. The key is quick wins with clear financial payoffs.

A survey of chief supply chain officers explored the importance of various supply chain levers. It found: "...supply chain executives have been using multiple levers to help support value creation. Information visibility is a means for companies to coordinate their supply chain activities to increase efficiency, reduce waste, and improve response time reliability. Hence information visibility becomes the foundation for all other levers."<sup>16</sup>

The sources of value and growth are shifting significantly. Principal businesses such as wholesaling, retailing, brands and financial services are more capital intensive than sourcing based on the agency model. With more capital at risk customer information and market intelligence have become critically important. The next stage is to develop a portfolio of third-generation value-added services for suppliers, retailers and brand owners. In addition to product design and development, these services could include market intelligence, hosted platforms and applications, managing sustainability and advice regarding best practices in manufacturing, doing business in China, sustainability and supply chain integrity, and e-commerce solutions.

These services are "third-generation" because they are significantly more dependent on technology and formal intellectual property, as with databases, software and models, than the first-generation agency services and second-generation principal businesses. The future is in value-added services and customer experiences based on innovative use of information and sophisticated analytics. This will require investments in IT platforms, intellectual property and people with new skills and capabilities.<sup>17</sup> Supply chain members must decide when to develop these assets internally and when to buy them through acquisitions and venture investments. Roberts and Liu (2001) conclude that a company should use, in a timely and appropriate way, a broad range of business development strategies, including alliances, joint ventures, licensing, equity investments and mergers and acquisitions, in order to perform optimally over its underlying technology life cycle.

The lead time for building revenues and profits from third-generation services is significant and the successful business models are unclear, but think of retail merchandise managers using a portal for market analysis, sourcing, procurement, supply chain optimization, inventory control and multi-channel fulfilment. The immediate challenge is to start and accelerate the learning process regarding which services customers and suppliers want and need, how to demonstrate their value, the right business models to monetize them and how to defend them from commoditization.

As noted above, managing supply chain sustainability and its associated risks have become high priority issues. Locke et al., (2009) undertook groundbreaking research into the effectiveness of compliance and commitment-based approaches to sustainability. They concluded that the compliance model rests on misguided theoretical and empirical assumptions: “In contrast, ...a more commitment-oriented approach to improving labour standards coexists and, in many of the same factories, complements the traditional compliance model. This commitment-oriented approach, based on joint problem solving, information exchange, and the diffusion of best practices, is often obscured by the debates over traditional compliance programmes but exists in myriad factories throughout the world and has led to sustained improvements in working conditions and labor rights at these workplaces.”

Plambeck et al., (2012) focus on the challenges in China in the following passage: “Given how much of the world’s manufacturing takes place in China and the damage it has wrought on that country’s environment, most analysts expect that multinational brands’ supply chains will face increasing scrutiny in the coming years.” The authors highlight the limitations and counter-productive effects of an audit and enforcement approach to health, safety, environment and labour practices. They present a series of activities for getting to know your supply chain and then acting effectively based on that knowledge. “Any sustainability effort in China must start by creating a context that facilitates identification and visibility into the supply chain,” they conclude.

Innovation is a key element of a successful response to the changing business landscape. But innovation is not easy. Large, mature companies often lack the capabilities to be successful with a disruptive product or service innovation.<sup>18</sup> There are significant obstacles that should be reduced or eliminated. Successful innovation is a journey defined by the lessons learned from a series of quick, low-cost experiments. The willingness to experiment and ability to learn are critical success factors.<sup>19</sup>

The imperative now should be to get started quickly, simply and inexpensively. The objective of these experiments is to demonstrate an idea and its value by making the innovation tangible. Quick wins reinforce the commitment to innovation and accelerate the virtuous dynamics of learning and value creation. Research has highlighted critical success factors for innovation initiatives.

- Experiment inexpensively and often – overcome the bias toward doing things on a large scale and the aversion to anything “quick and dirty”

- Prototype early – expect this to be an iterative process, assume you won't get it right the first time, and show the prototype to customers
- Empower managers two to three levels from the top to approve and fund experiments – most of the time this can be business unit leaders
- Expect failures – encourage people to try and enable them to “fail soft” without career damage
- Involve customers – listen to them, learn from them and recognize that often they are the source of innovation
- Use social networks to encourage and reward sharing – the business benefits must come first, then the personal satisfaction
- Create much more value from existing assets – make innovative use of current capabilities, information and relationships
- Establish mechanisms for internalizing new technologies – eliminate the obstacles to collaboration with smaller ventures and outside vendors, and
- Show the payoff in practical terms – measure the effect on customer satisfaction and retention, staff turnover and productivity, revenues and profits

E-commerce is developing rapidly in all markets. It is a strategic priority and major source of growth for existing customers. And the pure plays such as Amazon offer a wide range of new opportunities like private label programmes. Supply chain members need to get ahead of customers regarding e-commerce. Many still are racing to catch-up. The current lack of e-commerce understanding and capabilities and the obstacles to effective collaboration with small ventures and other sources of e-commerce technology are very serious problems. Bold action is required to deal with them.

Differences among supply chains are important for how we think about change and policy impacts. The following typology recognizes differences along four dimensions:

- Architecture – modular versus integral relationships, global versus regional, physical flows versus digital
- Objectives – cost, quality, speed, flexibility, innovation, resilience, policy benefits

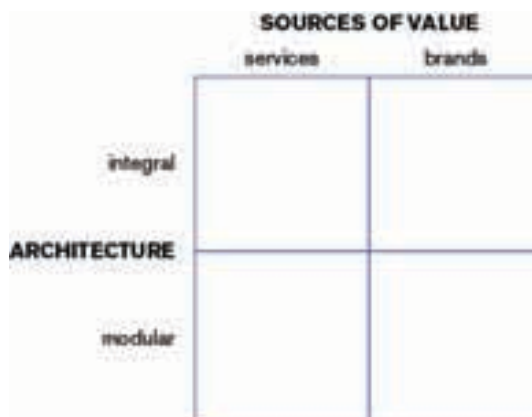
- Sources of value – manufacturing, services, retailing, brands, design, intellectual property, and
- Key dynamics – competition, commoditization, clock speed, fragmentation, integration, concentration.

In theory there are many combinations of these factors but in practice a limited set of variations are most significant. Here are two examples: modular/global architecture moving physical goods with the primary objective of cost minimization, creating value through sourcing and retailing in a highly competitive and commoditized market environment (Wal-Mart); and integral/global architecture with the primary objectives of flexibility and innovation, creating value through brand, design and IP, in a fast moving market dominated by a few powerful players (Apple).

The simple typology in Figure 7.8 combines aspects of architecture and sources of value. Many traditional supply chains fall in the lower left quadrant. They generate value primarily through operational services such as sourcing and logistics. Relationships are modular such as undifferentiated, transactional and easily substituted. These supply chains are the most vulnerable to commoditization and disruption and where the members will have the greatest difficulty prospering in the new market ecology.

The most robust supply chains create value by supporting a strong, differentiated brand. Examples include Amazon, Apple, Body Shop, Ikea, Nike and Zara. Relationships are integral, deep, strategic and enduring. There is a level of mutual trust that enables

**FIGURE 7.8: A typology of supply chains**



Source: Author.



information sharing among supply chain members and thus collaborative problem solving, learning and performance improvement. These supply chains are the most flexible and adaptive.

The major challenge facing supply chain members is to prepare for a very different business landscape, sooner than most expect. Some understand the need for change and the changes that are needed, but others do not. Many are thinking incrementally and seem over-confident, even complacent. They say: “we understand what is happening and already are responding. We have plenty of time. Don't worry, everything is under control.” These words have been heard many times before, for example, from leaders of the major telecom groups when the Internet, broadband, mobile, and wifi were turning their world upside-down. It is what Sull (1999) calls active inertia. The capabilities, culture and beliefs that made a company successful become constraints that cause insufficient and ineffective responses to market disruptions.

Our understanding of the dynamics that are reshaping global supply chains is incomplete. The influences of government extend beyond trade policies, taxation and market regulation. They can include proactive collaboration with the private sector to create enabling infrastructure and resources. How do these initiatives affect the objectives, architecture and sources of value and key dynamics of supply chains? Much of the literature on supply chains focuses on products. Services, including finance, healthcare, education, and entertainment have their supply chains, too. How do service supply chains differ from those for products? What are the implications of the digitalization and virtualization of services? These are very fertile areas for research.

## Endnotes

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- 1 Fine (2005).
- 2 Pipenbrock (2009).
- 3 Gonzales and Low (2012).
- 4 Pipenbrock (2009).
- 5 Fine et al., (2002).
- 6 Lee and O'Marah (2011).

- 7 Evans and Wurster (2000).
- 8 Lee (2003).
- 9 Miles (2003).
- 10 Financial Times (2012).
- 11 Fine (1998).
- 12 Weil (2012).
- 13 Brown and Hagel (2003).
- 14 Grove (1998).
- 15 Pine and Gilmore (1998).
- 16 Lee and O'Marah (2011).
- 17 Gawer and Cusumano (2002).
- 18 Christensen and Overdorf (2000).
- 19 Henderson and Clark (1990); Roberts and Liu (2001); Munir and Phillips (2002); Christensen, et al., (1998).

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# 8 Uncertainty and risk in global supply chains

Donald Lessard<sup>1</sup>

## 8.1. Overview

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Many discussions of supply chain risk begin with graphic depictions of situations where small disruptions lead to a large impact. Sheffi (2005) describes the sequence of events beginning with a lighting strike to a Philips factory in New Mexico that led to the disruption of a generation of cell phones, with Nokia successfully overcoming the disruption through proactive management while Ericsson lost out.

Such examples serve as illustrations of today's highly interdependent supply chains and the risks inherent in their geographic dispersion and organizational fragmentation. However, which stories are told depends on whose perspective is taken. The principal focus of the global supply chain literature is on the consequences to corporations that are supply chain owners, orchestrators or customers from variations in product demand (Lee, 2002) and potential disruptions in the supply chain (Sheffi, 2005; Simchi-Levi, 2010)

In contrast, the international labour and global production system literature<sup>2</sup> focus on the risks to workers engaged in the global production system from factory relocations and closings, highly variable working hours and unsafe working conditions. A sampling of stories from this perspective over the last year includes Adidas closing its last Chinese plant, the Bangladesh factory fire that killed 112 workers and the Foxconn labour protests over pay and working conditions. These risks to workers also circle back to the corporations that control and use the supply chains via reputation and, perhaps, legal action, as with the suits brought against Samsung by three French rights groups. Li Qiang, head of China Labour Watch, said: "we've never found any Foxconn factory where overtime reaches 186 hours a month. But we found that in one of Samsung's factories."<sup>3</sup>

A third focus is on the risks faced by firms and entrepreneurs who comprise the supply chains as the result of macroeconomic or product volatility and competitive dynamics. In the short run, many of these firms encounter significant swings in demand from individual customers whom they must accommodate. In the longer run, they face the uncertainty as to whether they will survive to see another day. This aspect is a central focus of the general industrial development literature focusing on “upgrading”.

Finally, the regions and nations whose workers and firms make up the supply chain are also exposed to disruptions, volatility and shifting competitiveness and their impact on local incomes, structural change and the environment.

This chapter focuses on all four of these perspectives on the risk of globalized supply, production and value chains.<sup>4</sup> In doing so, we take a multidisciplinary perspective, combining insights from international business (economics and strategy), finance and operations.

This chapter is organized in eight parts. Part 2 defines uncertainty and risk in the supply chain and identifies the layers of risk that affect the supply chain. Part 3 examines the relationship between globalization and risk. Part 4 addresses the different forms of mitigation appropriate to different types of risk. Part 5 introduces the concept of comparative advantage in bearing risk. Part 6 assesses the incidence of supply chain risk versus the capacity to bear risk for a set of stylized supply chain stakeholders. Part 7 discusses global risk pressure points and priorities. Part 8 concludes with a brief discussion of which supply chain risks can be relatively successfully managed by individual actors versus those that require concerted efforts by groups of suppliers, by policymakers or by the two groups working together.

## 8.2. Defining uncertainty and risk in the supply chain

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Definitions of uncertainty and risk vary by discipline as well as by perspective so that there are many, often contradictory, framings. Economists by and large use the definition introduced by Knight that uncertainty refers to situations where many outcomes are possible but specific probabilities are not assigned, while risk refers to situations where specific probabilities can be attached. Financial economists, by contrast, tend to lump together uncertainties and volatilities and define risk as the product of a distribution of state-specific outcomes and a position or exposure, as in value at risk (VAR). Supply chain specialists coming from an operations research tradition typically focus on product demand volatilities and specific events that

disrupt the supply chain. Juttner et al., (2003) provide a succinct definition: "In simple terms, supply chain risks refer to the possibility and effect of a mismatch between supply and demand. 'Risk sources' are the environmental, organizational or supply chain-related variables which cannot be predicted with certainty and which impact on the supply chain outcome variables. Risk consequences are the focused supply chain outcome variables such as costs or quality, i.e., the different forms in which the variance becomes manifest."

In this case, the terms "risk sources" and "uncertainties" are interchangeable, whereas risk consequences are defined as "impacts on supply chain outcome variables" of particular risk events or outcomes.

In this chapter, we define sources of risk as variables whose future values are not known with certainty, either because of a lack of information regarding the underlying process, because they are the result of social, economic or political interactions that cannot be fully predicted, or both. We define risk events or outcomes as specific realizations of these uncertainties, for example a fire in a factory or a trade dispute between the United States and China. Finally, we define risk consequences as the potential impact of realizations of these variables on the value(s) of the relevant objective function(s): cost, timeliness, safety or reputation for corporations that "are supplied"; variations in working hours and wages and safety hazards for workers; variations in short- or long-run profits for suppliers; and variations in overall income as well as other economic, social and environmental impacts for regions

### ***Risk sources***

The Fung Global Institute has identified five main sources of risk affecting supply chains in today's integrated global economy: state (national) factors, consumer dynamics, natural disruptions, man-made disruptions and innovation. I have added a sixth set, macroeconomic dynamics that overlap the state and consumer dynamics, as shown in Figure 8.1.

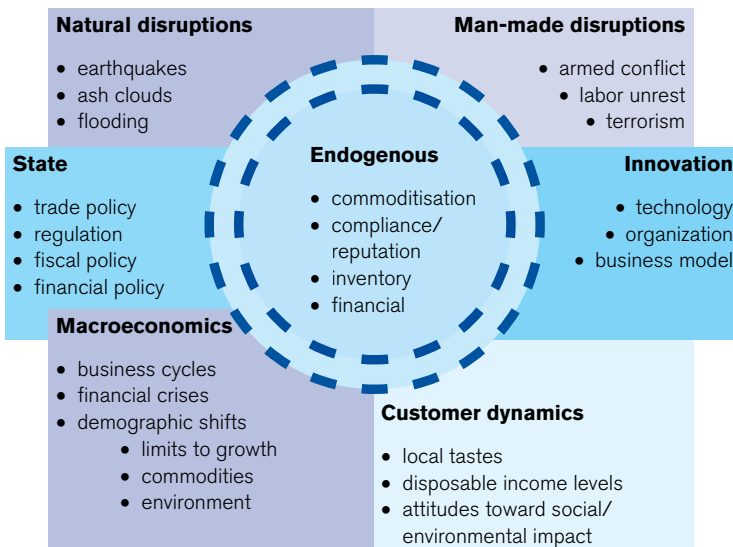
Each of these sources of risk has consequences for the four sets of actors we have identified: corporations that are "supplied", workers that produce, firms that comprise a part of, and regions that embody.

I find it informative to array these sources of risk from inside to outside by the "extent" of the system in which they are generated as depicted in Figure 8.2 for the apparel supply chain.<sup>5</sup>

The overall global system exhibits abrupt shifts and cycles as the result of shocks to some parts of the system, changes in the rules and architecture of the system and systemic risk from its inner workings. Markets focus and transmit these effects as prices vary to reflect changes in demand and supply. National economies, which remain a focal point of institutionalized interests and policy interventions, both create and ameliorate risk. Within this system, firms produce, source and sell competitively, responding to exogenous cycles but also introducing their own cycles through product introductions and other mechanisms aimed at garnering consumer attention and, perhaps, setting off fads or waves of adoption. Of course, the cross-border operations that make up the supply chain are themselves exposed to disruptions, which in turn are shocks to the whole system.

With globalization, determining whether a particular risk emanates from the national system, the industry or the global system is increasingly complex as these levels merge and overlap. Nevertheless, it remains useful to think of the overall system as a nested one, with global regimes representing the largest system, the global macro-economy and global markets (e.g., commodities, interest rates)

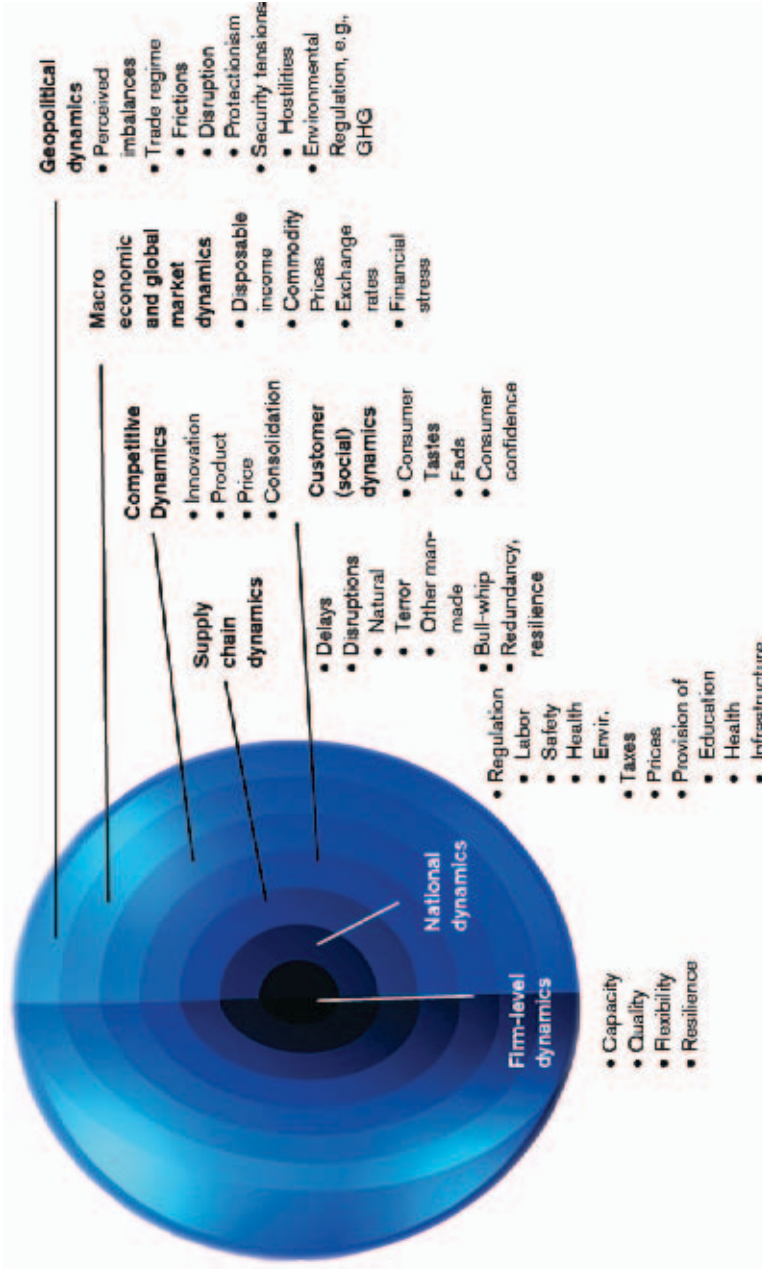
**FIGURE 8.1: Sources of risk for global supply chains**



Source: FGI Supply Chain Study.



FIGURE 8.2: Sources of risk from inside to outside



Source: FGI Supply Chain Study.

the next system, and so on through industry and consumer dynamics and finally to supply chains, all operating above or at least across national systems. Supplier firms, due to their physical locations, are nested in national institutions, though some through multinationality are able to transcend or arbitrage some of these national forces.

This classification has important implications for who can intervene in ways to reduce these risks by “shaping the sources of risk” and by mitigating their consequences conditional on a particular outcome. In general, risks resulting from inside sources are more controllable through management interventions, whereas outside risks resulting from outside sources are more amenable to hedging via financial markets.<sup>6</sup> With the globalization and fragmentation of supply chains, however, some risks that are ostensibly “inside” are no longer controllable by a single firm, and thus become (supply chain) system-level governance risks.

### ***Risk consequences in relation to stages in the supply chain***

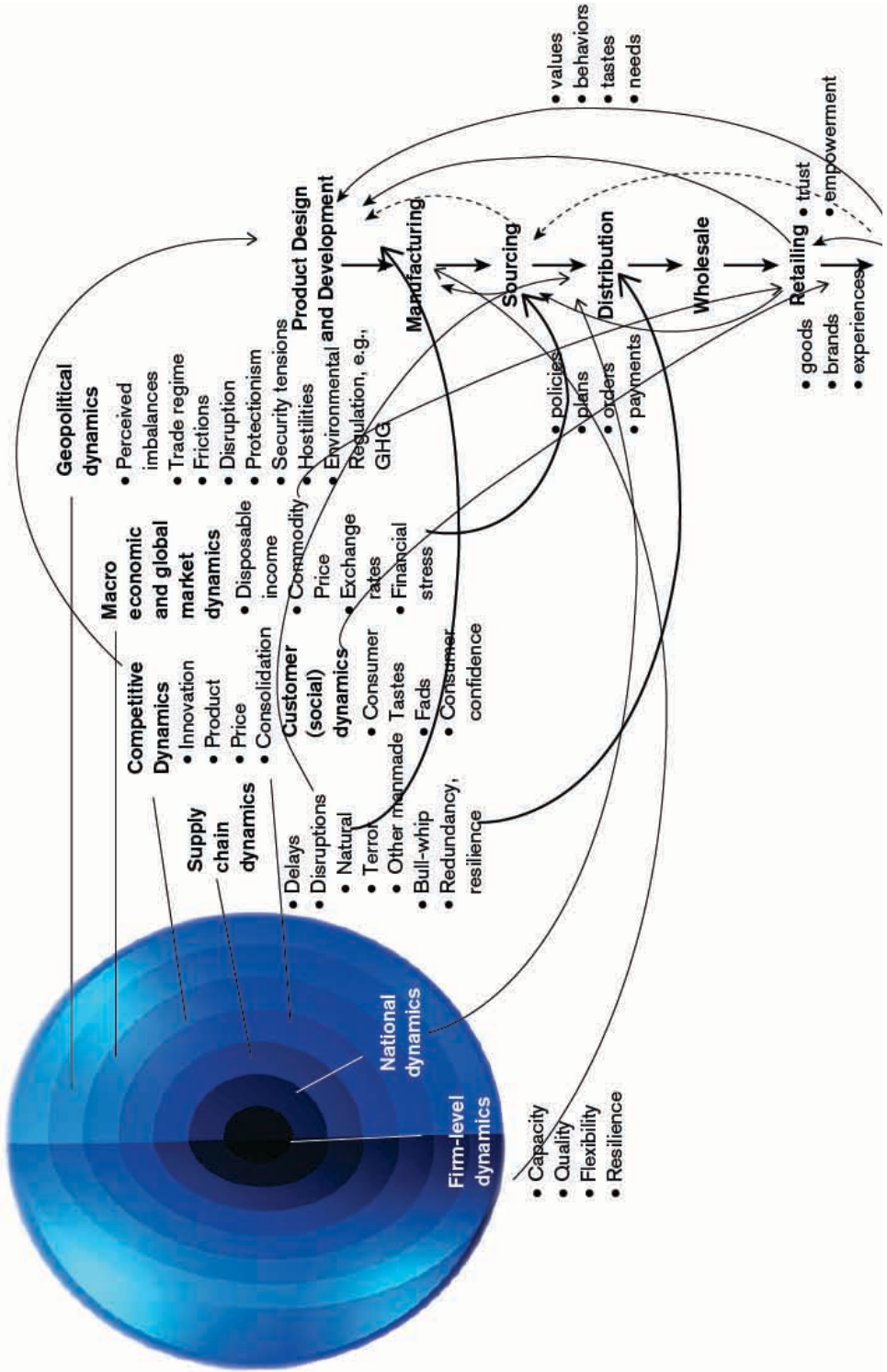
Each risk source-event-consequence chain interacts with specific elements of the supply chain. Macroeconomic fluctuations and customer dynamics drive product demand; innovation both derives from the resulting customer dynamics and influences them. Capacity and relative cost dynamics, as well as costs of trade restrictions and transport, affect the competitiveness of different manufacturing sites. Natural and man-made risks in the logistics system feed back into the timeliness of delivery as well as to the competitiveness of different manufacturing sources. This is illustrated in Figure 8.3.<sup>7</sup>

A key point that can be taken from this diagram is that (managing) risk at any point in the chain requires a focus on numerous sources of risk. Sourcing and distribution are particularly complex as they stand at the intersection of global, national, industry, and “local to the product” sources of risk.

### ***System level risks***

So far, our discussion has focused primarily on individual source-event-consequence chains, but supply chains are characterized by system-level risks as well. Classic among these is the so-called bullwhip effect where, due to the multiple stages in the chain coupled with lags in responses, a small initial demand

FIGURE 8.3: Sources of risk and their supply chain impacts



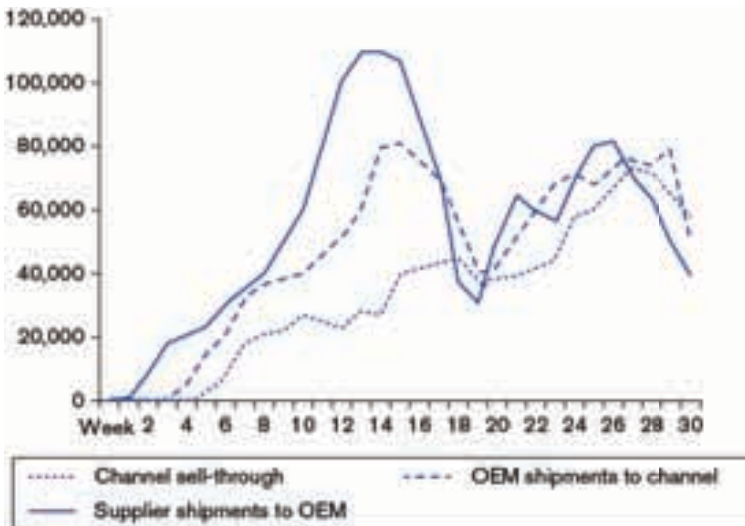
Source: Author and Weil (2013).

shock can trigger much larger variations in demand further back into the chain (Lee et al., 1997). Figure 8.4 shows this for an electronics manufacturing chain. Note that the volatility of supplier shipment to the Original Equipment Manufactured (OEM) is many times greater than the channel sell-through.

An even more complex system risk is reputational risk, where “unacceptable behaviour” such as the use of child labour, food contamination or environmental abuses in any stage of the supply chain may interact with increasing public attention to particular dimensions of performance and changes in the thresholds of what is deemed acceptable. Changes in any element can set off an escalating dynamic.

Figure 8.5 illustrates some of the feedbacks involved in reputational risk. It is important to note that while reputational risk is best understood as a consequence rather than a source of risk, it is the result of a complex set of system interactions.<sup>8</sup> As such, it is important to manage the sources of such risks rather than merely engage in damage control to reduce the consequences.<sup>9</sup>

**FIGURE 8.4: Risk magnification via the “bull whip”**

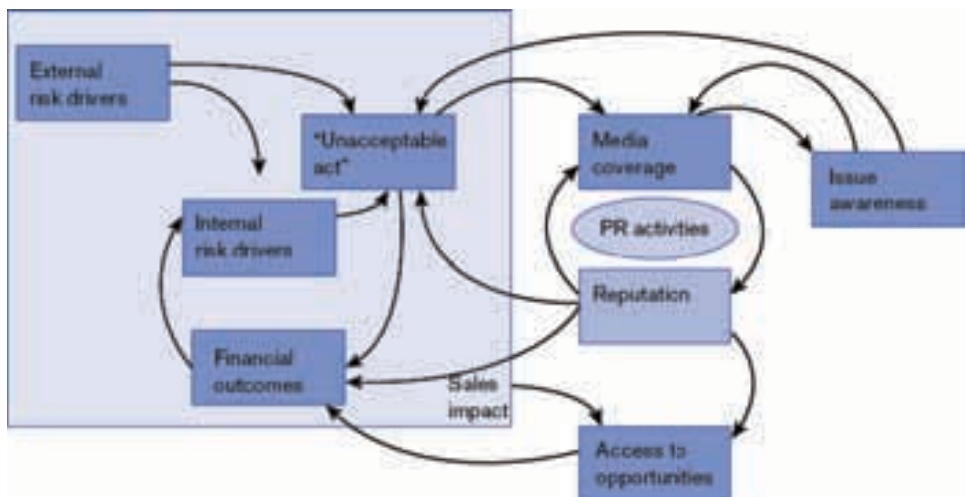


Source: Kaipia et al. (2006) cited by Samel (2012).

The most serious, of course, are “systemic risks” where the supply chain system as a whole grinds to a halt, perhaps due to the cascading effect of reductions in trade financing<sup>10</sup> or to escalating national reactions to trade imbalances or perceived abuses. As the volume of gross flows increases relative to net flows, the consequences of such systemic failures also increase.

The OECD supply chain study (OECD, 2012) prominently discusses systemic risks in the globalized supply chain, citing as examples the “great trade drop” of 2008–09 and the aftermath of the 2011 Japan tsunami and the associated nuclear disaster. While much of the discussion is about how global supply chains transmit shocks from one economy to another, it must also be recognized that due to their own complexity and layering and their dependence on a fragile systems of international cooperation and finance, they can be a source of system shocks as well. While systemic risk in the financial system has received the most attention, it also looms large in the global supply chain and is probably even less well understood in this context.

FIGURE 8.5: The reputational risk system



Source: FGI Supply Chain Study.

### 8.3. Global integration and risk

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Globalization, as defined as the increasing interdependence of national societies and economies, has two counteracting impacts on risk. On the one hand, it enables greater diversification of risk resulting from some sources of risk, particularly macro and product-level variations in demand. On the other, it enhances the potential for propagation of shocks from one nation to another. Ghemawat (2011) provides two contrasting examples, food and finance, where he argues that the benefits of “openness” outweigh the costs in the case of food security, but not for short-term capital flows.

In the case of supply chains, the same is true. A primary risk benefit of a global supply chain that serves multiple demands<sup>11</sup> (regions, products or customers) is the potential to reduce risk through pooling. This is an economy of scope that complements the scale economies and comparative advantage that motivate the creation of such chains. An offsetting risk-increasing impact results from the interconnection of geographically and institutional distant activities and includes, among other things, the risk of disruptions due to changes in trade policy, physical events, and man-made (careless or malicious) events, as well as the system risks resulting from the loss of direct control and the added complexity.

Global supply chains entail both physical and informational/reputational risk propagation mechanisms. With globalization, firms with recognized brands live in a “goldfish bowl” and lapses in any location can easily reach other locations. Further, a firm can quickly get into a vicious circle of attention as documented by Locke et al., (2007) and others. As Ghemawat notes, fear (or outrage) travels faster than fundamentals.

With increased integration, gross flows increase much more rapidly than net flows – within a single supply chain, product category, industry or the economy as a whole – as the benefits of scale, specialization and pooling increasingly outweigh trade and transportation costs, as illustrated in Figure 8.6. Risks of disruptions, of course, apply to the gross rather than the net flows.

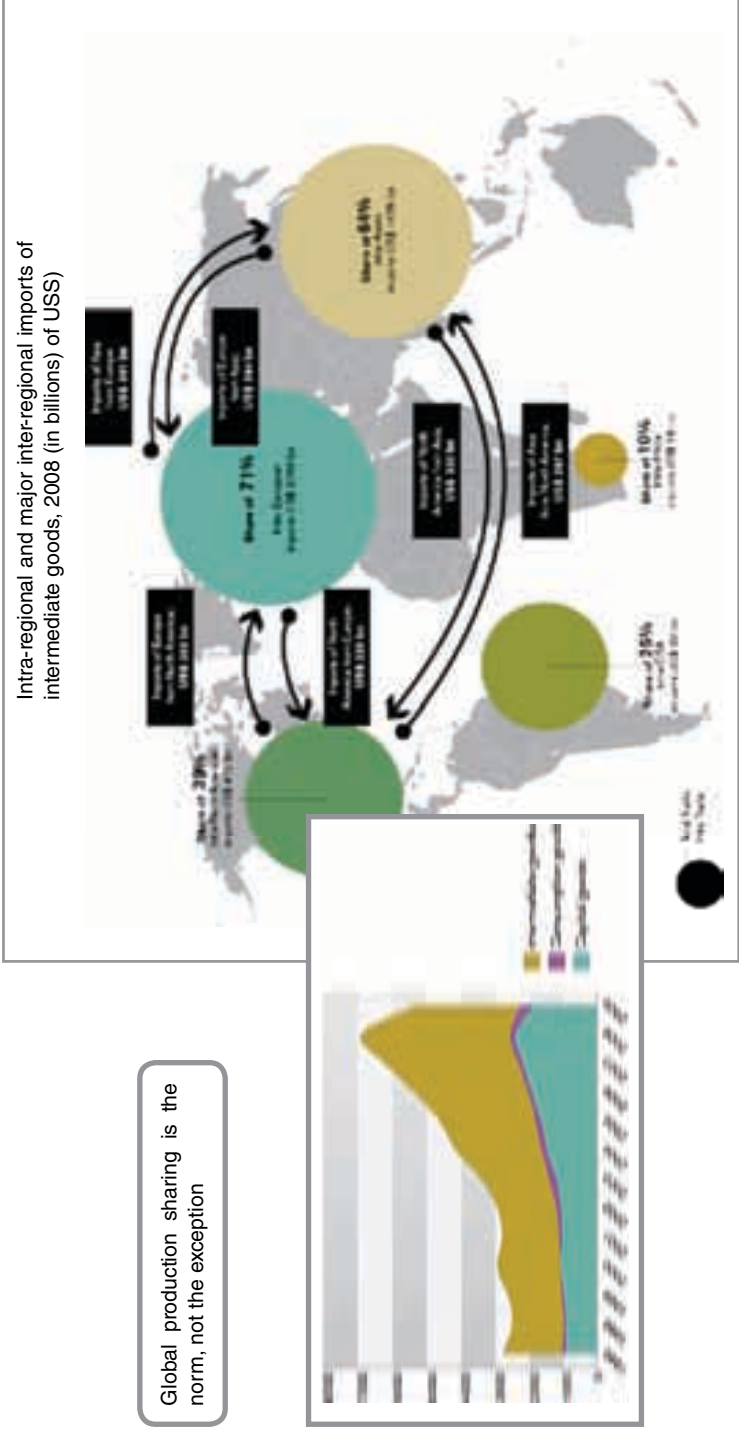
This grossing up implies more trade and transport, thus increasing the overall production system’s exposure to disruptions. Since the two effects – diversification and propagation – are offsetting, it is not possible to state as a general matter that risk favours the lengthening or shortening of supply chains.

### 8.4. Risk management responses

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Risk management in operations, including supply chains, is typically described as comprising three steps – identify, characterize and mitigate.<sup>12</sup> We broaden the definition of mitigation to include three complementary sets of activities: reduce (mitigate), pool and transfer.

**FIGURE 8.6: Global production sharing**



Source: FGI Supply Chain Study.

Regardless of the type of risk driver or consequence, there are only a small number of fundamental types of possible response, either before or after the fact. These include responses that: 1) have the potential to change the probability distribution of outcomes – what we refer to as shaping risks – and thus change the stand-alone cash flows from the operations in question; 2) those that have the potential to improve the consequences of the affected operations conditional on the realization of the risk outcome – real options and real pooling; and 3) those that redistribute risk without affecting the stand-alone distributions of outcomes and consequences – financial diversification, hedging and insurance – and thus alter the risk of portfolios of assets held by firms or investors.

Some source-outcome-consequence chains are amenable to only one type of management intervention, whereas different actors may be able to respond in multiple ways to others. In general, there is a “pecking order” of risk management responses for risks involving “things that break,” “things that vary”, and “regimes that change.”<sup>13</sup>

“Things that break” correspond to operational failures such as delays or gaps in quality or to disruption due to man-made or natural hazards. In most instances, these are “inside” risks at the supplier or supply chain level and are best addressed by building effective organizations with properly aligned incentives and commitment of its employees as well as an overlay of compliance and security. Diversification or pooling does not alter the expected losses associated with these errors, and insurance will be expensive (relative to the expected losses) due to the moral hazard involved. Multiple or flexible sourcing will mitigate the impacts of supply interruptions, but not of product quality.

“Things that vary” correspond to fluctuations in product and macro demand and to commodity and financial prices. Strategic risks associated with irreversibly committing resources in the face of cost or demand uncertainties – by firms, by workers or by regions – often can be addressed by creating options to allow a greater range of responses in line with future outcomes. These real options, though, are costly, so only some of them will add value. A variant of the real option is pooling, whereby a firm is able to employ a specific fixed capacity to serve a variety of different product or national market demands, thus enhancing the expected cash flows for this set of activities while reducing their volatility. This is different from and more effective than financial diversification that simply reduces portfolio variance by mixing different distributions without altering their expected values. On the other hand, pooling requires standardization and specialization, and it may limit the ability of firms to integrate forward or backward in the chain and is subject to diminishing returns as the number of “demands” that are pooled increases. This standardization and specialization, in turn, benefits from regional agglomeration that allows the co-specialization of firms and provides a barrier to entry benefiting relatively few locations.

When “things that vary” are traded in markets, such as exchange rates or commodity prices, it also is possible to shift these risks through hedging in financial markets.



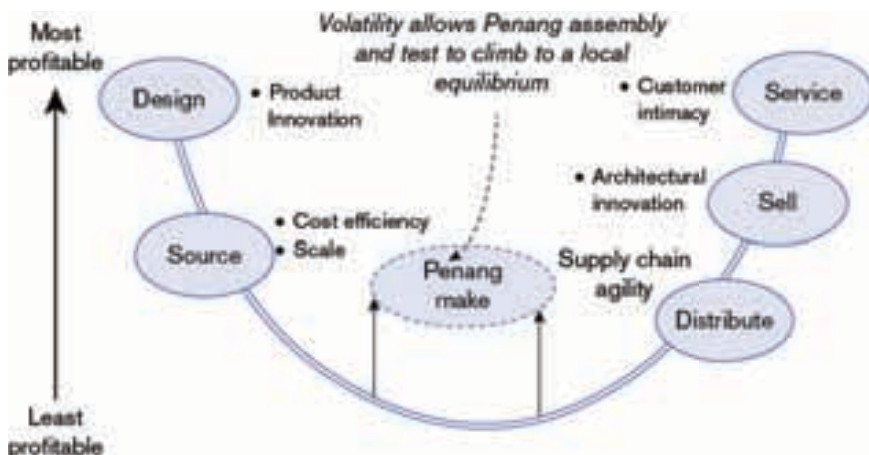
“Regimes that change”, e.g., global or meso-level (national or state/local institutional/policy) risks are often ill-defined as they depend on the decisions of governments, or regulators. Transforming them through influence, however, is sometimes possible. Further, flexibility and diversification can ameliorate their impact on any given supply chain actor.

## 8.5. Comparative advantage in risk taking

While individuals, firms and countries are generally risk averse, it does not necessarily follow that they all should seek to avoid risk or transfer it to others. A form of comparative advantage exists whereby risks should be taken on by those actors with: 1) the greatest knowledge about them, 2) the greatest ability to mitigate or shape them, and 3) the greatest ability to withstand the residual impacts remaining after these two stages through diversification and resilience.<sup>14</sup>

Samel (2012) notes that a key aspect of the “division of labour” is the issue of who bears and deals with various uncertainties and risks inherent in meeting unpredictable macro and product demand through a distributed and fragmented supply chain and illustrates this with a set of electronics assemblers located in Penang, Malaysia. Located in the bottom of the “smile curve” as shown in Figure 8.7, and hence

FIGURE 8.7: Risk specialization in the value chain profit curve



Source: Samel (2012) drawing on Cisco, inspired by Stan Shih.

presumably commoditized and earning low margins, some Penang assemblers in the electronics supply chain have succeeded in commanding both relatively high wages for their workers and relatively high margins for themselves by specializing in bearing volatility in product demand.

They do so on the basis of accommodating labour regulations and institutions (including an ample pool of immigrant labour), a broad set of relationships with design and end-product firms that allow them address extreme fluctuations in product demand, with surges in production requirements from 250 per cent to 500 per cent within a year and cut backs of up to two-thirds within the same time frame, through to the pooling of production and relatively simple technologies that can be reconfigured quickly, as in changing the number of assembly lines. The volatilities of orders for each product or relationship act as a barrier to entry, since it is costly for new entrants to match the scale and organizational and managerial capabilities required for pooling and pliability. This risk is partly transformed by pooling and partly transferred to workers through volatile hours. Samel concludes that these firms' abilities to take on volatility limits their incentive and ability to "upgrade" technologically. I would take the argument a step further: "upgrading" should be redefined to include higher levels of production technology, greater innovation and greater ability to withstand and profit from volatility.

Hon Hai (Foxconn) also appears to gain much of its advantage from its ability to quickly scale production to meet demand. This is particularly important given the "winner take all" nature of network effect consumer electronic products that is exacerbated by the fact that product demand is "pulsed" to build a self-reinforcing wave of sales.

The inherent volatility of demand in supply chains at the macro and product level, in fact, appears to be one of the key barriers of entry to the supply chain and access to higher value added (Buckley, 2009).

## 8.6. Supply chain risk and the capacity to absorb risk

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Supply chain stakeholders differ in their exposure to particular risks, in their capacity to absorb these impacts and in their ability to mitigate or hedge those risks. The key concern from an extended view of the supply chain that includes labour and small and medium sized enterprises (SMEs) is the extent to which different supply chain actors have greater or lesser scope to manage a particular set of risks and

to what extent mitigating risk requires concerted action by local, national or global communities versus individual firms, by policymakers or perhaps by coordinated action by both groups. A related issue is to determine which risks within specific supply chains can be relatively successfully managed by individual actors versus those that require concerted efforts by groups of suppliers, by policymakers or by the two groups working together

A disruption in a particular source, whether due to a natural calamity, a man-made error or a malicious act at that source or a disruption to another stage, will result in the failure of the supply chain to deliver the promised products on a timely basis. It may also entail a significant loss of income for labour and a loss in capacity utilization and income for the factory owner that will be exacerbated by any investment in raw materials or work in process that it has undertaken. The orchestrator typically will lose proportionally on its throughput, unless of course it has another source of supply. The brand owner may or may not lose depending on whether it (or its orchestrator) has an alternative source of supply and, if not, whether the ultimate product is a freestanding product or a component of a more complex system, as well as whether or not it faces close substitutes in the marketplace.

If the disruption is systemic to the supplier country or region, as with a natural disaster such as Fukushima, a transport shutdown, or a policy “embargo,” then the supplier country will suffer a similar proportional impact, or perhaps even larger, due to the social capital and infrastructure involved.

This is illustrated in Figure 8.8 for a disruption in the supply chain, in panel “A” for a disruption that is specific to a single product or facility (e.g., the lightning strike to Philips’ factory) and in panel “B” for one that applies to all activities in a particular location (e.g., Fukushima).

An SME factory owner is very exposed to specific disruptions relative to its capacity to absorb for two reasons. First, a factory typically has fairly high fixed costs and therefore the impact of disruption is “leveraged.” Second, the owners often own one or a few business assets and thus have a substantial proportion of their wealth at risk. Larger, more diversified suppliers are in a better position, which implies that a “hazardous” world is particularly so for SMEs.

Labour is highly exposed because wages depend on continuity of operations, and household income typically is even less diversified than that of the SME factory owner.

The supplier community or economy is typically sufficiently diversified that a single disruption has only a very small overall impact.

FIGURE 8.8A: Impact capacity to absorb for specific disruption

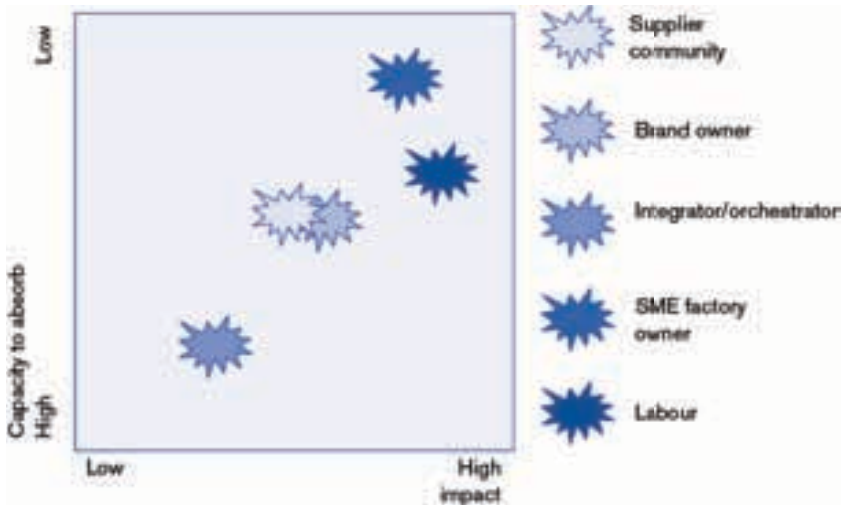
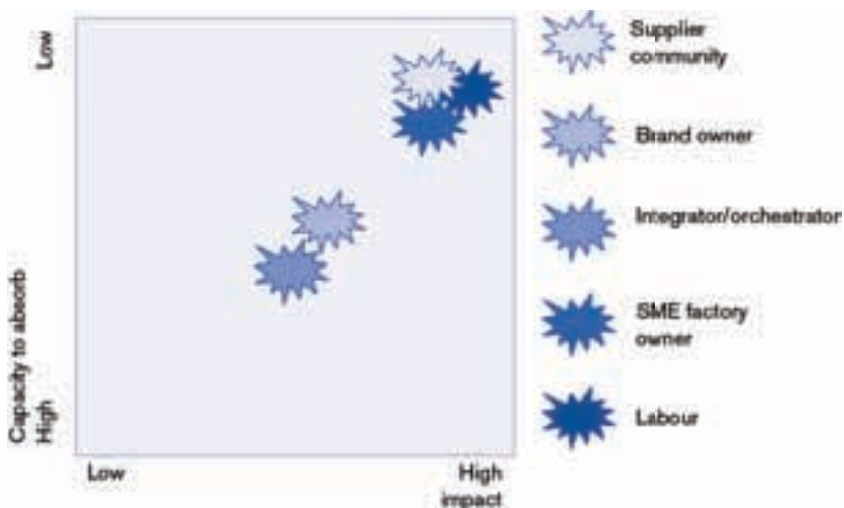


FIGURE 8.8B: Impact capacity to absorb for a general disruption



Source: Author.

The big difference between Figures 8.8A and 8.8B is the exposure of the supplier community. With a general disruption, it sustains losses or outages in many different activities, reducing fiscal income, putting pressure on social safety nets and, if the disruption persists, it suffers an erosion of the value of infrastructure and social capital that underpins its long-term competitiveness.

As a general matter, the exposure or vulnerability of a particular stage in the supply chain to a given risk depends on its operating leverage, its competitive or contractual position that determines the extent to which it can pass on or must absorb the impact, and its flexibility in adjusting to the impact within the activity. Its ability to absorb the impact depends on its diversification, its financial strength and its flexibility across activities.

The exposure of labour will depend on the employment terms which determine how these impacts are shared with the employer, with the greatest exposure corresponding to situations with piecework pay and no premium for or constraints on overtime as opposed to one with a greater salary base and premiums for constraints on overtime. Foxconn and Apple's recent voluntary steps to avoid excessive overtime (Bradsher and Duhigg, 2012 and the Economist, 2012) represent one step toward rebalancing this exposure. However, as noted by Locke et al., (2007), regulatory standards will be necessary as well.

Table 8.1 illustrates the impact relative to the capacity to bear risk for these five stylized stakeholder groups for a variety of different risk outcomes. Of course, the rankings depend on more dimensions than it is possible to represent in a

**TABLE 8.1: Incidence of supply chain risks relative to capacity to absorb**

Risk type Risk impact	Specific disruption	General disruption	Cost shock (e.g., exchange rates)	Product safety	Commoditization, shift in tastes
Extremely high	Factory, brand owner <sup>15</sup>	Factory, brand owner <sup>16</sup> , supplier community	Factory, supplier community	Brand	Factory owner Brand
High	Labour	Labour <sup>17</sup>	Labour, supplier community	Labour	Labour
Moderate	Brand owner <sup>18</sup> , supplier community		Brand	Supplier community, Orchestrator	Orchestrator
Low	Orchestrator	Orchestrator	Orchestrator		

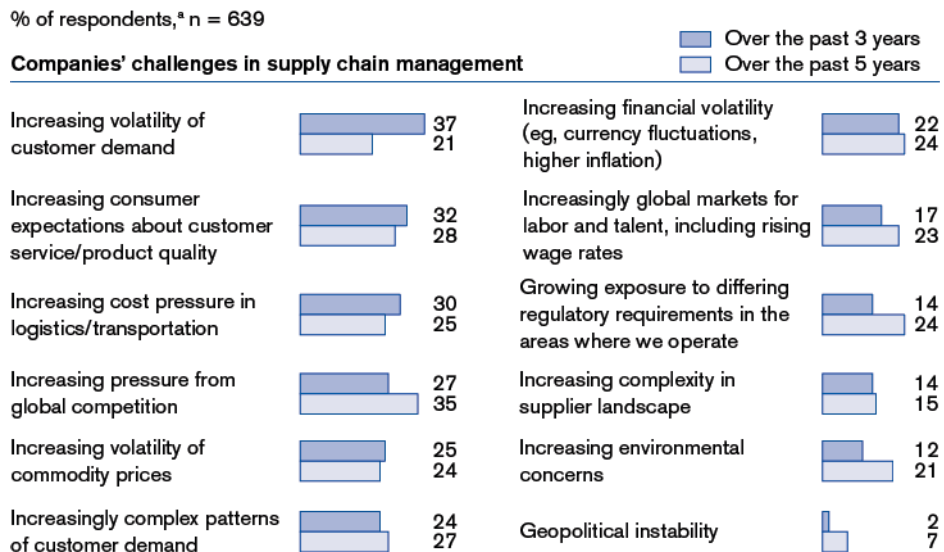
Source: Author.

single diagram, but the point that comes through is that factory owners, because of their high operating leverage, and labour, because of their limited diversification, are typically highly exposed. Factory owners can diversify their activities across products, brands and regions to increase their capacity to absorb risk, whereas labour only has access to this risk spreading if it occurs with a single factory. Brand owners are very highly exposed to reputational and system impacts but less so to cost impacts.

### 8.7. Global pressure points and priorities

There are many issues with global supply chains. Some are unique to specific stakeholders, while others cut across all actors. While not all involve elements of uncertainty and risk, most do. A recent McKinsey survey of CEOs (McKinsey, 2010), shown in Figure 8.9, highlights the importance of “things that vary” (the volatility of consumer demand, commodity prices, financial systems and the difficulty of finding labour to match demand) and “regimes that change” (regulatory concerns,

**FIGURE 8.9: Sources of global supply chain issues**



\*Respondents who answered “other” or “don't know” are not shown.

Source: McKinsey (2010).

environmental concerns). This is different from the reactions of supply chain managers that are much more focused on “things that break.”

These responses map closely to the five key pressure points identified by the Fung Global Institute Supply Chain Study. These include:

- a) Changing patterns of production costs and demand resulting from higher incomes and consumption levels in emerging economies, as well as new demands and expectations from consumers (changes that reconfigure supply chains and value-added attribution);
- b) Changing risk profiles (operational risks, customer and consumer dynamics, political and geo-political risks, natural and man-made disasters, policy instability);
- c) New social and environmental pressures and realities;
- d) New technologies and innovation (in manufacturing, services provision, IT-driven opportunities);
- e) The policy scene (policy is not just a risk factor on account of changeability, but also a disruptor in its own right).

These five also match up closely with executives' responses regarding their firms' preparedness to address various global supply chain issues. As shown in Figure 8.10, they consider their firms quite capable of addressing competition and customer demand but not exposure to volatile exchange rates, commodity prices, regulatory requirements or geopolitical instability.

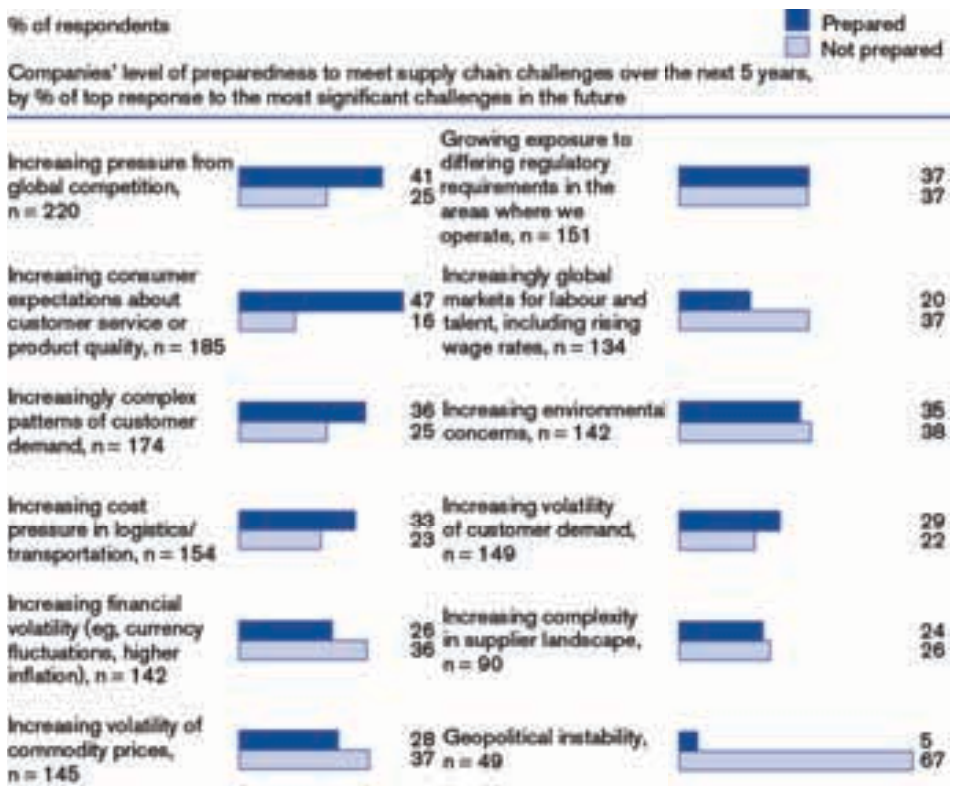
Brand owners,<sup>19</sup> especially in food or health-sensitive chains, are concerned with their reputation as supply chains extend across firm and national boundaries. Firms whose products are integrated into sensitive systems, such as IT, Internet, electrical power or commercial aircraft and engines, are very concerned with quality as a failure in one component can have system-wide impact. The sources of risk of these potential outcomes are mostly man-made and involve both careless and malicious behaviour. Risk management is not a zero sum game among the stakeholders in a given chain, as the concern with quality makes the chain sticky and tends to align the interests of all parties in the chain.

These risks are also of concern to labour, facility owners and supplier communities since they raise the cost of “long” chains and favour “near-shoring”, other being things equal.

In the wake of disasters such as Fukushima, continuing threats of terrorism and increased frequency and severity of protectionist moves by major-destination countries, brand owners and customers have a heightened concern with potential disruptions of existing supply chains. While important for all supply chains, reliability of supply is the most highly valued as a function of two dimensions: 1) criticality of continuity in supply as with medicines, food and energy, and 2) criticality of the supplied product as a component in larger integrated systems.

Brand owners, and the factory owners who supply them, are also increasingly concerned with the perceived sustainability of their operations, both in human and environmental terms.

FIGURE 8.10: Issue preparedness



Source: McKinsey (2010).



Customer communities, including but not limited to government, are concerned with continued access to supplies, as well as to maintaining or regaining a “fair share” of value added.

“Near-shoring”, which is seen by many as a way to reduce supply chain risks, will reduce disruption risk and product risk in the form of stale inventories held in the supply chain, but it will increase product demand volatility in terms of employment and factory loading as it limits the spreading and pooling of this volatility across regions.

Finally, all actors have an interest in policy disruptions, but some have more than others since typically they have the greatest impact on the longest chains.

## 8.8. Conclusion

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The globalization and fragmentation of supply chains creates risk through inter-linkages and interdependencies. However, their global scope also has the potential to reduce the impact of risk associated with macroeconomic and product volatility by allowing the pooling of diverse demands. This trade-off is central to the current discussion of “near-shoring” as a potential solution to supply chain risk. While “near-shoring” would reduce the risk of cross-border disruptions, it also would limit the ability of suppliers and workers to pool diverse demands. Further, unless matched by the creation of redundant supply and logistics links within each region, “near-shoring” would not eliminate the risks of supply chain disruptions and might even make them greater. That said, steps can be taken to reduce the risks associated with global supply chains and better distribute them among consumers, brand owners, orchestrators and providers of logistics and other supply chain services, SME and large-scale factory owners, and workers. In considering these steps, it is important to recognize the underlying sources of risk as well as the risk events themselves and the comparative advantage of different parties in affecting and absorbing various risks.

Much of this risk reduction and redistribution will result from the self-interested and self-organizing actions of the private firms that comprise global supply chains. Sophisticated firms that can successfully orchestrate complex supply chains will increase their ability to absorb volatility and work around disruptions through increased resilience, and they appear confident that they can do so. This often will require basing deep capabilities in multiple locations. Similarly, SMEs, whether by choice or evolutionary selection, will increasingly group themselves in deep clusters that provide this resilience at a systemic level.

Risks associated with consumer safety such as food safety or counterfeit drugs, by contrast, will require concerted actions including government regulation. In the case of product contamination in the food chain, the immediate cause lies in the incentives for cutting corners by producers competing anonymously in commoditized markets. At a higher level, the issue lies in the absence of a direct connection between producers and consumers, something that could be restored to some extent by a stronger reliance on brands. However, while large, sophisticated firms can to a large extent address these risks through internal controls and branding, experience suggests that a combination of legally mandated and “brand-based” self-regulation is most effective. Further, purely “brand-based” regulation would tend to reduce the role of SMEs in these chains. Risks emanating from other forms of malicious behaviour, particularly involve similar arguments as well as the recognition that they often cross over into the realm of security that inevitably involves nations.

Risks to workers emanating from volatility and the incessant cost pressures of global supply chains are another area where some form of concerted action and regulation is necessary. In the case of excessive overtime or worker safety violations, for example, the immediate causes are choices made by factory owners and managers and often also failures in the existing compliance systems. At a deeper level, as argued by Locke and Samel (2012), the causes lie in the cost and timing demands placed on production units by the brand owner. These demands may result from volatility that is beyond their control, but they may also result from volatility that they impose as part of their business model or because of imperfect responses to external volatility. Voluntary leadership by these firms can improve things, but it is likely that some form of regulation is required, especially in highly competitive low margin segments.

Finally, risks emanating from uncertainty regarding changes in global regimes are costly to all yet lie beyond the scope of private actors in supply chains. In the case of trade frictions and the imposition of selective trade barriers, the immediate cause is the action of nation states themselves. However, at a deeper level these are driven to at least some extent by the very distorted picture of trade imbalances, especially with respect to China, provided by the current system of trade accounting.

Re-establishment of a vibrant multilateral trading regime would appear to be the ideal outcome, though it is not clear that it is feasible in the near term. A smaller step that might lead to a reduced risk would be a new set of WTO rules whereby “retaliatory” actions by one nation against another would take the form of across-the-board increases in tariffs rather than that of penalties imposed on specific products. This,

along with continued pressure against non-tariff barriers, would increase the fluidity of the trading system and avoid sudden sharp shifts that impose severe costs on suppliers, especially SMEs, and on workers.

In sum, risk management in the context of global supply chains involves much more than mitigating the impact of outside risks such as swings in aggregate demand or exchange rates on individual elements of the chain. It also requires systematic management of risks that are generated within each link in the chain and, more importantly, in the interfaces among links in order to limit disruptions and their propagation throughout the system. This requires risk awareness and responsibility in every activity as well as active intervention by orchestrators with a system-wide view. It also requires careful redesign and management of the soft and hard infrastructure that supports the system.

While the self-interested behaviour of individual supply chain actors can be counted on for many of these aspects of risk management, the geographic dispersion and organizational fragmentation of supply chains, and the incidence of supply chain risks on important groups beyond the corporations who are customers and orchestrators – workers, SMEs and ultimately regions and nations – also imply a need for concerted action at the industry, national and global levels. It will be necessary to create “scaffoldings” of effective product safety and workplace standards and trade and finance regimes so as to allow this distribution system to function as an effective whole. It requires a global village.

## Endnotes

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**1** I thank Retsef Levi, Patrick Low, Albert Park, Hiram Samel, Andrew Sheng and Henry Weil for their comments. This paper was prepared for the Fung Global Institute's Global Supply Chain Initiative.

**2** See e.g., Coe et al., (2008), Gereffi and Memedovic (2003), Locke and Samel (2012), and Sturgeon (2008).

**3** Mundy (2013).

**4** The use of all three terms is deliberate, signalling the different perspectives of these literatures: supply chains (SC) focusing on the ability to match supply and demand, global production networks (GPN) on the division of labour and governance in the chain, and global value chains (GVC) on the roles of various actors in the chain and their ability to capture value/rents).

**5** For earlier versions of this diagram, see Lessard (1996), Lessard and Lucea (2009), Lessard and Miller (2012). Christopher and Peck (2004) propose a similar three-level classification: risks

internal to the firm, risks external to the firm but internal to the supply chain network and risks external to the supply chain network. Simchi-Levi, D. (2010). *Operations Rules: Delivering Value Through Flexible Operations*. Cambridge, MA, The MIT Press, *ibid.* presents a taxonomy that combines the “inside-out” and “known-unknown” dimensions.

**6** In order for a financial market to be developed for a risk: 1) the risk must be outside of the control of any of the potential market participants (to avoid moral hazard) and 2) it must affect many economic actors with a degree of balance among positive and negative exposures.

**7** While the supply chain typically is depicted as a linear flow, Li and Fung defines it as an open circle beginning and ending with the customer. We use Weil’s depiction that combines these two by explicitly incorporating information and financial flows along with physical product flows.

**8** This depiction of reputational risk is based on conversations with Henry Weil and was initially sketched by him.

**9** This is consistent with the distinction between commitment and compliance drawn by Locke, et al., (2007) in reference to the management of reputational risk arising from labour conditions in the supply chain.

**10** Sheng (2009) traces the 1997 Asian financial crisis to just such a cascade.

**11** The same argument could be applied to in-bound logistics, assembly, or distribution assets that are specific to the product or source.

**12** In contrast, in finance risk management is typically viewed as characterizing risk (variances and co-variances or more complex measures of volatility), then selecting a portfolio or structure of hedges (to complement the “portfolio” inherent in the business) to best distribute those risks.

**13** Referring to Figure 8.2 that depicts risks from inside to outside, things that break correspond to firm-level and supply chain level risk; things that vary to customer, competitive, and global market dynamics; and regimes that change to changes in meso-level (national, state/provincial/ local) institutions and global regimes.

**14** See Lessard (1996) for the initial development of this concept.

**15** If integral element of complex system

**16** If integral element of complex system

**17** Perhaps higher due loss of alternative employment, social safety net

**18** If a free-standing product

**19** The term “brand owners” is shorthand for firms that use their brand to capture (some of) the value they create through innovation, integration, and quality. These firms typically create customer solutions and experiences in contrast to just delivering products or services.

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# 9 The influence of customer buying behaviour on product flow patterns between trading countries, and the implications for regulatory policy

**John Gattorna**

## 9.1. Introduction

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This paper is designed to provide a more granular perspective than the traditional aggregate view that economists take of supply chains. In particular, I want to add a behavioural dimension, and introduce a more dynamic methodology, capable of addressing the increasingly volatile operating environments that are likely to pervade future trading conditions within and between countries, whether developed or developing.

The objective of this paper is to develop a toolbox of creative methodologies that will add insight to what we already know about supply chains and point the way towards improved navigation of the cross-border movement of trade flows.

From the outset, let us deal with some of the terminology issues. In my view, there is no difference between the terms supply chain and value chain, because supply chains done well equals value chains.

Regarding the term networks, these develop from local to regional to global, with correspondingly increasing complexity. The important thing to realize is that you should attack this growing complexity from the outside in, not from inside out as per conventional practice. Of course, the ultimate solution selected will be a combination of both.

Fundamentally, people, their respective behaviours, and the decisions they make in particular circumstances propel products and services along supply chains, so

it is vital that human behaviour is factored into all future value chain designs. This is non-negotiable if the objective is to achieve a finer alignment between buyers and sellers and a necessary precondition if we are to take operational and financial performance to the required next level. Understanding human behaviour is the elephant in the room but, unfortunately, too many executives are in denial about its pivotal influence, presumably because they do not know how to factor it into the performance equation.

And people are spread out along supply chains, in the form of customers, intermediaries, staff and management inside suppliers and the enterprise itself. The optimal result is obtained when all parties (including outside influences such as government) along specific supply chains, approach a degree of “alignment” in the way they think and act.

Thus, looking at the operation of supply chains through the narrow prism of economics is not sufficient. Human behaviour must be factored in, just as the eminent economist, Robert J. Shiller, Professor of Economics at Yale University commented in the aftermath of the 2008 global financial crisis. He was acknowledging the human effect on the economy. See Shiller (2009).

Indeed, simply observing macro-flows of goods and services across or within country borders, hides the important detail beneath, and blunts the search for more predictive supply chain business models. In such situations, the emphasis is on reactivity, but there is a limit to reactive designs because of the premium cost attached to this *modus operandi*.

If we are going to work from the outside-in, we need a meaningful way of grouping customers into economically viable segments and then reverse engineering back into the enterprise from there. Most, if not all, conventional methods of segmentation used by the marketing discipline are flawed when used for the purpose of supply chain design. The only method that will adequately inform supply chain design is behavioural segmentation, grouping customers, consumers and users with similar buying values (and corresponding behaviours) according to the product and service category under consideration.

Through our empirical work in companies drawn from many industries, and across numerous geographies in the period 1989–2012, we have found discernible patterns in the way customers project their demand for products and services. These conclusions are summarized as follows. See Gattorna (2010).



1. Customers always exhibit a small but finite number of dominant buying behaviours for any given product or service category, usually no more than three, but four at most (to give an 80 per cent fit to the market).
2. The preferred dominant behaviours exhibited by customers can change temporarily under the pressure of changing (operating) conditions such as lifestyle changes, government regulatory action, or the product life cycle itself. But behaviours usually return to the preferred position when conditions return to “normal”.
3. Where there is a permanent change observed, it is usually associated with a change in the customer's own internal decision-making group.
4. Finally, it is not unusual to observe more than one kind of buying behaviour inside a large corporate customer, where different groups are involved in buying different product or service categories.

These observations explain two phenomena:

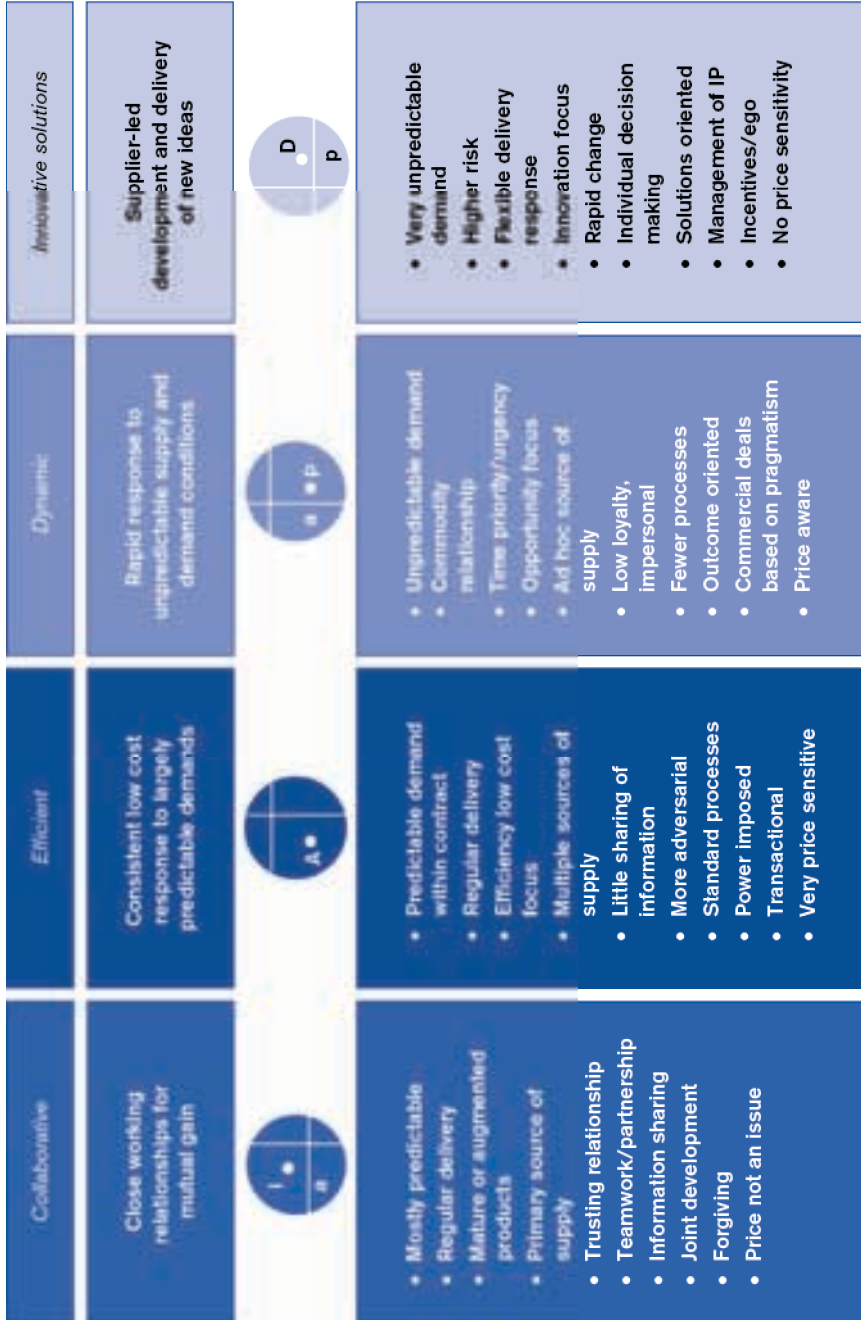
1. That customers can exhibit more than one buying behaviour, under varying conditions, and hence more than a single supply chain configuration is required to cope with this plurality; and,
2. That such changes can be brought about for many reasons, including government regulatory actions – this is the connection between supply chain designs based on customer behaviour, and the impact of different government policies (such as tariffs, customs duties, wages, and development incentives) which can either help or hinder product and service flows.

We can now say with some confidence, that the most common buying behaviours and behavioural segments observed in the marketplace are the following four types:

Collaborative, transactional, dynamic and innovative solutions, the characteristics of each of these is described in the Figure 9.1 below.

What is also very significant is that as we look at how customers buy certain products and services in different countries across the world, the only thing that changes is the mix of the originally-identified buying behaviours. We put this down to the influence of national cultures superimposed on individual or business unit buyers, see Gattorna (2010).

FIGURE 9.1: The four most commonly observed dominant buying behaviors



Source: Adapted from Table 1.3.1 in Gattorna (2003), p. 32; see also Gattorna (2006), p. 41.

This is a particularly important finding because it means that we can set up the same supply chain configurations around the globe, and they will be just as relevant from one country to another. Of course, the prevailing government regulations and competitive activity could influence things in specific locations, but it is unlikely any fundamentally new segments will suddenly emerge out of nowhere. This is good news for multinational companies as they design their regional and global value chain networks. It is also good news for the future work of the WTO.

At the enterprise level, in reviewing regional and global markets, there are really only two appropriate methods open to companies to surface the underlying demand patterns. These are:

1. Using a shortened version of the well-known conjoint analysis market research technique, where a sample of customers are interviewed (qualitatively and quantitatively) face-to-face and by telephone. A draft “straw man” segmentation is prepared as a result, and this is then validated with further direct contact with customers in the field; and,
2. Of perhaps more relevance in the case of aggregate flows of product important in trade flows between countries is the demand variability analysis otherwise known as the co-efficient of variation. The methodology is as follows:
  - a) Profile the total demand, by-customer or source, by-year for say two to four years to understand overall patterns. Demand should be broken down by major product categories,
  - b) Then calculate the co-efficient of variation (CoV) by customer or product category in a few sensible time buckets, such as monthly or quarterly, over the selected period. This will give a perspective on the relative variability of different customer’s demand,
  - c) The CoV is a method of comparing the variability of different data sets. It is calculated by dividing the standard deviation by the mean, expressed as a percentage. By setting some business rules, it is possible to distinguish between volume flows with lower variability (base load or lean), compared with volume flows which has a higher variability (agile).

For example, we conducted this type of analysis on the demand (and export) of thermal coal from the Hunter Valley region of New South Wales, Australia, in

the four-year period, 2003–06. Congestion was occurring at the loading Port of Newcastle, and at one stage there were 75 Cape size ore carriers in a queue out to sea, waiting to be loaded. The business rules we applied to the demand side were as follows:

1. Any one customer included in the analysis had to take at least 1 metric ton (MT) in any of the given years; and,
2. The CoV for each customer was calculated, and any customer with a CoV equal to or less than 50 per cent by month, or less than 33 per cent by quarter would be considered base-load demand, with all the implications for a lean style of supply chain configuration,
3. Anything above these numbers would be regarded as volatile, with all the implications for an agile style of supply chain configuration.

Based on our analysis in 2007, for a total demand of 100 MT per year along the coal chain and embarking port, 60 per cent of the volume was found to be base-load, and 40 per cent to be volatile, requiring two entirely different supply chain configurations or pathways, lean and agile, working in tandem, but managed separately. But if the two demand patterns are mixed together, no analysis is possible, and things degenerate into guesswork and opinion. This is very relevant to the way we look at trade flows between countries as the same problem applies.

## 9.2. Resolving rising complexity

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The term “supply chain” was first coined by Keith Oliver at Booz Allen<sup>1</sup> in 1982. I have long been uncomfortable with this term but have chosen instead to continually redefine its scope over time, rather than introduce new terminology, which in turn just adds to the semantic confusion.

Indeed, the more accurate term these days would be value networks, as argued in my book, *Dynamic Supply Chains*, see Gattorna (2010). And networks they are, spreading from local to domestic national trading environments, becoming regional as more countries are involved in strategic sourcing and/or distribution strategy, and ultimately, global. The complexity of these “networks-of-networks” increases exponentially as the geographic scope widens, and the number of links (both transport and electronic transactions) and nodes (facilities of all types and activities within) increases.

During the last two decades we have seen an explosion in the size and complexity of value networks as companies embraced global sourcing, offshoring of production and jobs, and dispersed manufacturing. In some cases these trends have already been reversed or are in the process of changing as conditions have changed. Indeed the reallocation of global manufacturing will become more pronounced over the next five years, especially as companies face decisions about where to add future capacity. The best companies will undertake a “product-by-product analysis of their global supply networks” taking multiple factors into account, both directly related to production cost, and others of a more indirect nature, such as cross-border inefficiencies, see Sirkin et al., (2011).

As the economics of production change because of escalating labour costs and availability (as is now the case in China), the impact of carbon footprint, and the corresponding thrust towards a more sustainable world, these value networks are again being reshaped. And this evolutionary process will continue indefinitely, spurred on by the new “Age of Digitization” that we are just entering. See Friedrich et al., (2012) and El-Darwiche et al., (2012). This digitization will facilitate different pathways for the physical product and corresponding financials and make revenue recognition for tax purposes more difficult. The same can also be said for the true country of origin on the label, as there are likely to be several involved as the product progresses towards its final form.

One thing we can say with certainty is that the increased degree of complexity posed by extensive global value networks opened up through multi-country trading activities will never be resolved by conventional means such as bilateral agreements and centrally devised and administered regulations. We need to borrow ideas from Ashby’s Law of Requisite Variety, (Ashby, 1954; 1956) and seek out fundamentally new and sophisticated solutions to this growing problem. In short, we need completely new business models to make any sort of impression on the inexorable rise in complexity.

To paraphrase, Ashby says that as systems become more complex through increased variety, then the complexity-reduction devices we deploy must necessarily become correspondingly more sophisticated to match this complexity. In effect, to manage complexity in supply chains – and supply chains are after all living organic systems – we have to absorb variety, otherwise the whole system is likely to become brittle, unstable and prone to collapse, perhaps catastrophically, see Gattorna (2010).

Unfortunately, the modern obsession with enterprise resource planning (transactional) systems has in part unwittingly contributed to the increased complexity too.

Paradoxically, company executives, thinking that more standardization of processes and underlying systems would reduce the complexity they face, have in fact made things worse as the new [more rigid] systems installed have further reduced the degree of natural “alignment” with customers, and in so doing led to more exceptions, increased cost-to-serve, and more (rather than less) complexity. This is a good example of what happens when attempting to fix a problem from the inside out.

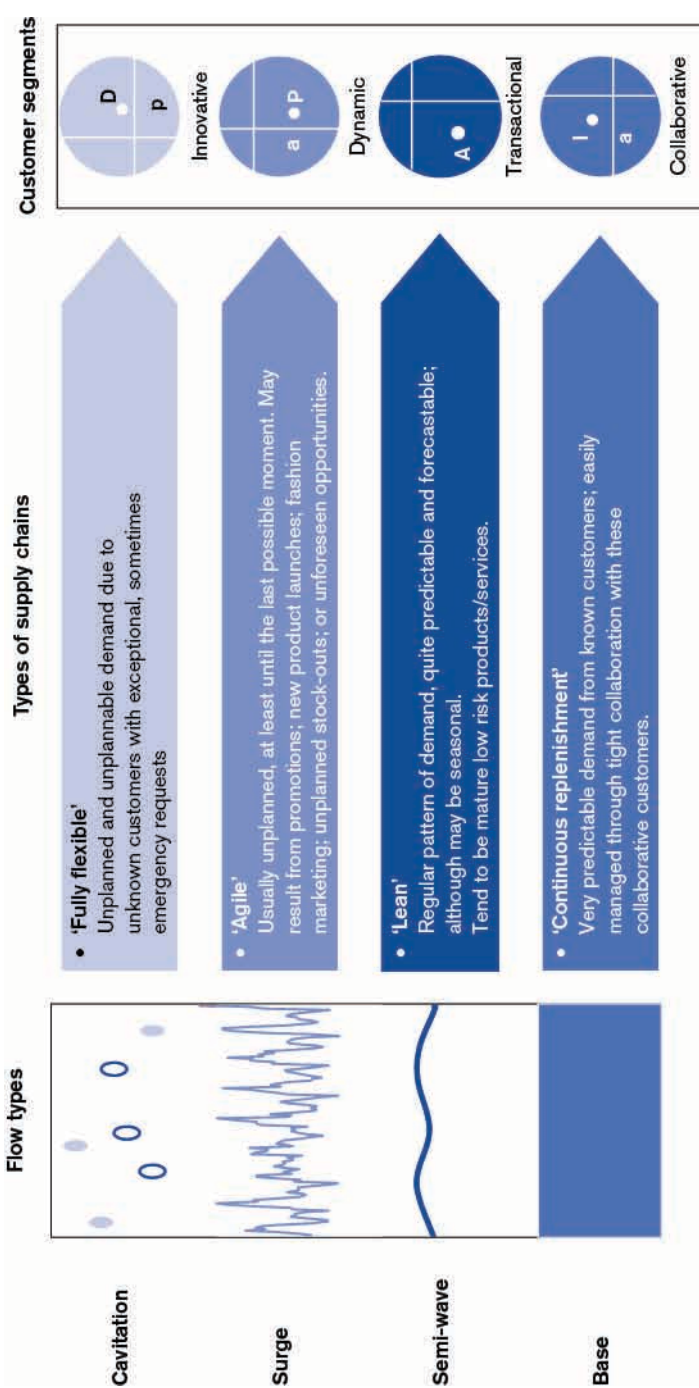
At the country level, complexity has arisen simply because of the rate of growth that has occurred in the process swamping existing capabilities. China is a good example of this. India is another example that is in an even worse situation because of its poor infrastructure. At least China has made giant advances in this particular area. Yet both countries lag in finding solutions to smooth the flow of trade through their inbound and outbound supply chains as evidenced by their low standing in the *Ease of Doing Business Index* referred to later in this paper. See Lawrence et al., (2012).

Fortunately, we now have at our disposal network optimization modelling techniques that have the potential to cut through complexity and allow us to in effect find the lowest cost pathways through nominated networks, from the supply base to customers, anywhere in the world. These mixed integer mathematical models have been available for the last few decades, but it has taken the hardware on which they run time to catch up and achieve the required higher processing speeds. The best models currently available are designed by Solvoyo (Boston) and Llamasoft (Ann Arbor).

In addition, instead of running the models against some arbitrary objective function, we can link them to the behavioural segmentation mentioned above and in the process find out what the possible pathways and corresponding cost-to-serve are for any given product-market combinations, under particular operating conditions, including government taxes or incentives, tariffs and carbon footprint. Indeed, there is practically no scenario that we cannot model these days, and the result is a whole new level of more informed decision-making by executives and government officials.

These new Decision Support Systems (DSS) are likely to provide a bright new avenue for exploring government policy options in the future, especially where constraints are placed on trading flows across borders. The core concern is to be in a position to make more informed decisions, and for confirmation of this you only have to look around the world at the winning sporting teams who benefit by making better, faster and more timely decisions than their opponents in the heat of competition.

FIGURE 9.2: Flow types and matching supply chain configurations



Source: Gattorna (2010), p. 53.

Based on my work and that of colleagues inside multinational companies, I expect that we will find ways of fast-tracking certain product flows, by embedding agile processes along certain preferred pathways, albeit at a premium cost, and for the residual, less volatile flows, I expect it will be possible to design lean pathways that carry flows on a more regular, predictable basis, at lowest delivered cost.

The key is to separate the two flow-types and treat them completely differently. Once this is achieved, overall costs will fall, as will complexity, and more certainty in trade relationships will return. The trick is to eliminate both the over and under-servicing and reallocate resources to achieve a finer-grained alignment between the supply base and the corresponding target customer base.

The main supply chain flows we are interested in are depicted in Figure 9.2, and in particular the combined steady-state flow made up of lean and continuous replenishment components, which are largely predictable and have low variability.

### 9.3. Infomediary capability<sup>2</sup>

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There is one other enhancement to the network optimization modelling approach suggested above, and that is to form an infomediary in key industries to pool and aggregate data in order to better manage trade flows. Specifically, the term refers to an organization designed to allow information to be gathered from multiple parties and used productively while protecting the confidentiality of other contributors. Prashant Yadav of MIT and the University of Michigan have already used this approach in attempting to improve the forecasting of essential medications in developing countries. See Levine et al., (2008).

Yadav conceived the idea of a global health infomediary, which collects information from funding agencies, procurement agents, national buyers and other parties who have a wealth of information available but do not necessarily share it.

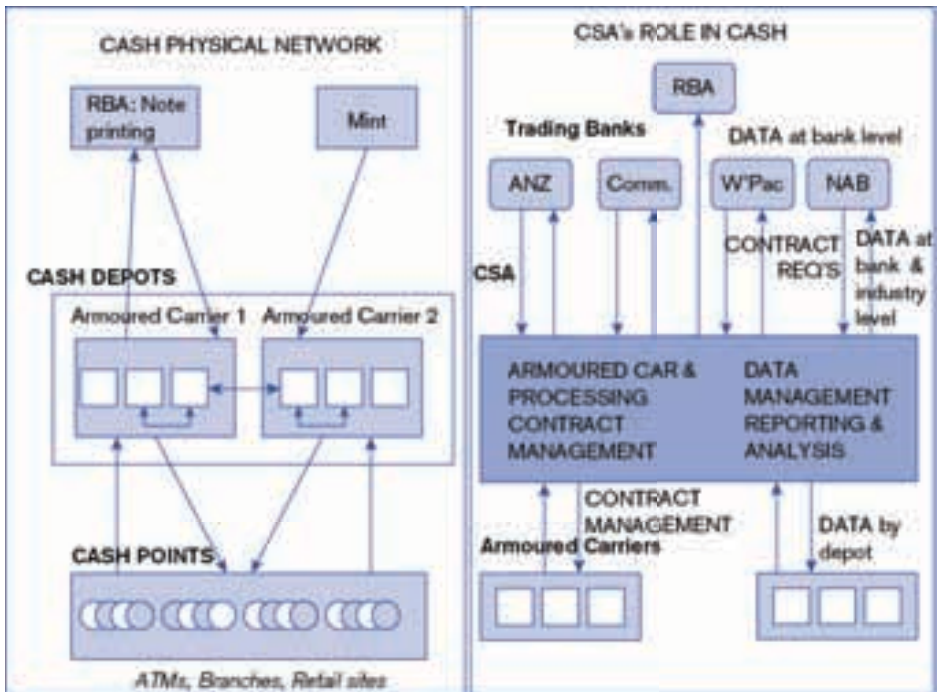
My colleague, Deborah Ellis, and I found a similar business model working in Australia at Cash Services Australia (CSA). This company is jointly owned by Australia's four biggest banks. It gathers information on the individual and joint cash requirements of these banks (both inbound and outbound), and uses this information to direct pick up and delivery of cash from and to strategic locations, spreading the physical task across several armoured car companies.<sup>3</sup> See Gattorna (2010) and Figure 9.3 of this chapter.



At the enterprise level, the equivalent is the control tower, which companies such as Unilever are building to more tightly manage the flow of their products to markets using asset-heavy third party logistics providers (3PLs) to undertake all the physical movements. The forerunner of this application was the Fourth Party Logistics (4PL) model, developed originally by Andersen Consulting (now Accenture). See Gattorna (1998).

Another potential case is Port Waratah Coal Service (PWCS), which is the operator of the Hunter Valley Coal Chain, referred to earlier, 150 km north of Sydney. Over 100 MT of thermal coal per annum is exported to 75 global customers from this region, which involves 17 coal producers, 27 load points and 39 mines, three rail track owners, two rolling stock operators, one port authority and one terminal operator. As you can imagine, the mix of conflicting objectives and priorities among these disparate parties makes it very difficult to achieve a smooth flow of product

FIGURE 9.3: The new business model at Cash Services Australia



Source: Gattorna (2010), p. 369.

along the shared infrastructure and ship-loaders at the port. It is in fact a microcosm of what happens in inter-country trade flows. For PWCS, we have suggested an “infomediary” style of arrangement to ensure improved collaboration and efficiency.<sup>4</sup> See also Gattorna (2010).

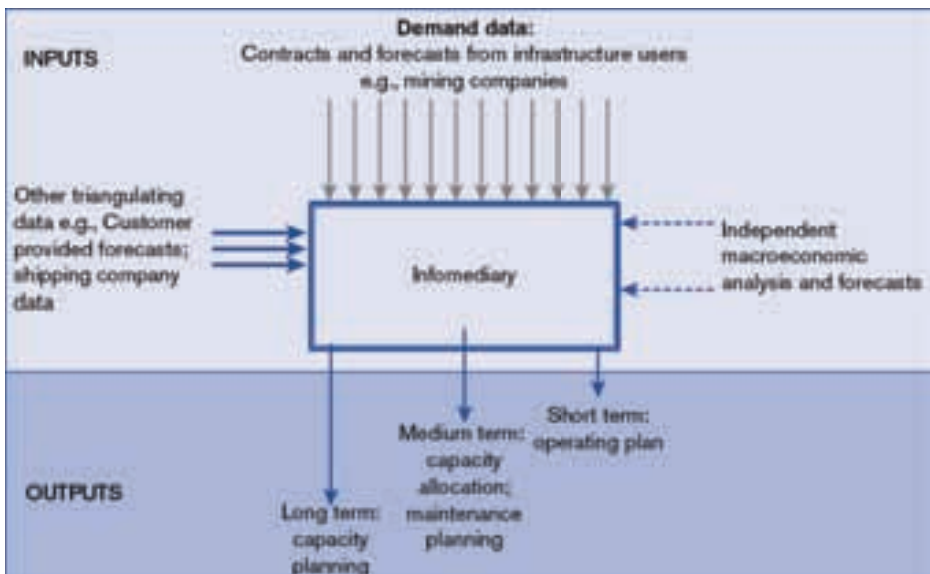
The broad principles embedded in an “infomediary” are depicted in Figure 9.4.

The point of suggesting this type of info-sharing vehicle is that it would not be difficult to replicate the arrangement for major product-industry categories in producing countries. This would have the effect of improving demand forecasts and smoothing cross-border product flows along key supply chains to export customers.

## 9.4. Introducing an over-arching fully-integrated end-to-end supply chain business model

Part of the problem that we face is that today there does not exist a unifying business concept to describe the B2B or B2C phenomena that links suppliers, enterprises,

**FIGURE 9.4: The new business model is needed to manage demand and capacity in multi-user supply chains**



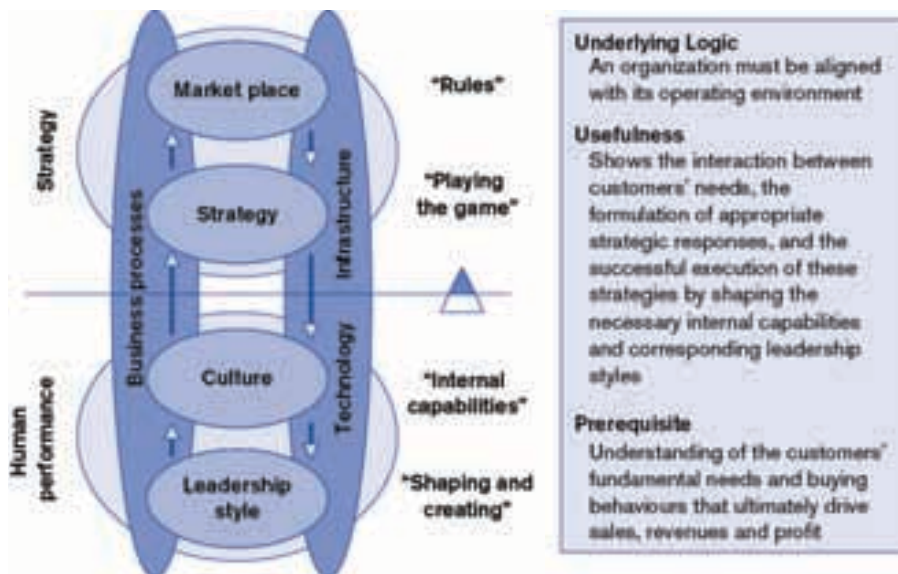
Source: Gattorna (2010), p. 373.

customers and users, either within or between countries. And what we do have is very fragmented, generally along functional lines.

Functional specialism still rules supreme, and the only problem with that is that customers are inevitably buying at 90 degrees (horizontal) to the way we manage our enterprises and public authorities (vertical). This has been an enduring problem faced by supply chain designers over the last few decades as e-commerce has overtaken us and it has highlighted the deficiencies in the conventional method of managing our companies and government authorities.

Somewhat fortuitously in 1989, several co-researchers and I began the task of re-conceptualizing how logistics systems worked in a corporate context, and this eventually “morphed” into how the broader concept of enterprise supply chains functioned in the firm. We started with the working hypothesis that if we could better align a company’s internal culture and leadership style with its marketplace through appropriate operational strategies, this would inexorably lead to improved, more sustainable operational and financial performance, and so it emerged. Figure 9.5 depicts the original concept.

FIGURE 9.5: Elements of the ‘dynamic alignment’ framework



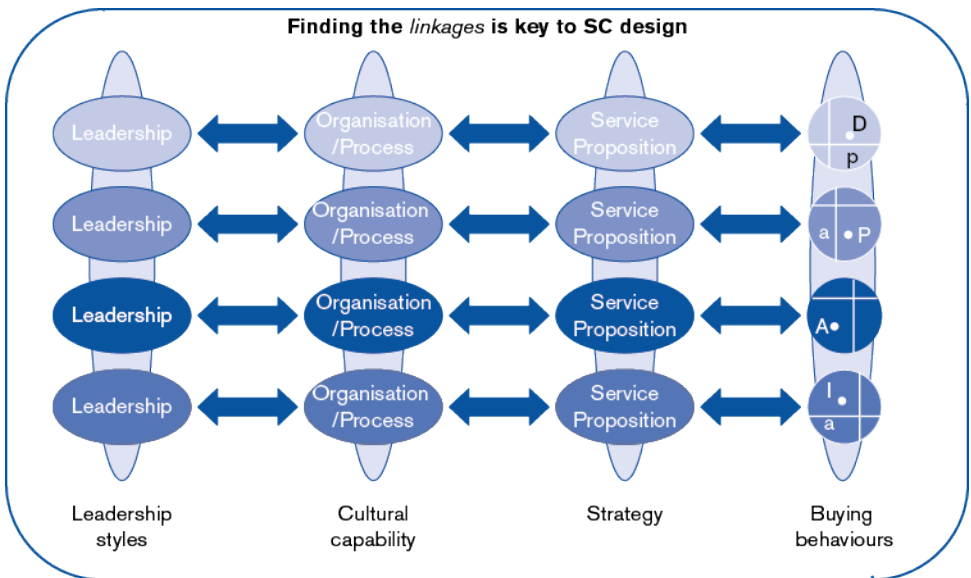
Source: Adapted from Figure 1.2 in Gattorna (2003), p. xiii; also Gattorna (1998), p. 5; and Gattorna (2006), p. 16.

We initially focused on ways to understand and reinterpret the marketplace as discussed earlier, and this proved to be a masterstroke, as we ultimately discovered underlying demand patterns in product-markets as diverse as dairy ingredients, thermal coal and electronic high tech (EHT).

What it told us is that contrary to conventional wisdom, humans are more similar than dissimilar, and that we could always identify three to four dominant buying behaviours (or behavioural segments as described earlier in this paper), out of a possible 16, that explained over 80 per cent of the demand in a given product-market situation. This was the breakthrough that we had been looking for, because it immediately informed us just how many supply chain configurations we needed to replace the previous outmoded notion of a “one size fits all” supply chain. We have continued our work for the last two decades, applying this thinking to many new and diverse product and service industries, and the evidence has continued to mount in support our original thesis.

On this basis we are able to reorient the above conceptual diagram (Figure 9.5) to represent the horizontal product and information flows found in enterprise supply chains as depicted in Figure 9.6 below. These show the four supply chain types that

**FIGURE 9.6: Multiple supply chain alignment on the customer side**



Source: Adapted from Figure 4.3.2 in Gattorna (2003), p. 459; see also Gattorna (2006) Figure 2.1, p. 40.

we very commonly see flowing through organizations, in parallel, all with their own particular operating characteristics and supporting capabilities.

## 9.5. Potential policy implications

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It is clear that among the biggest challenges facing trading countries are the border processes, specifically, import and export clearance. Import is typically more of an issue unless there is some manufacturing value-add involved, in which case import taxes and duties are offset or refunded through the subsequent re-export activity.

China is a good example of the latter. It has in place special export zones (SEZs) where goods can be brought in under a bonded system, and then transferred to approved manufacturing locations, and later re-exported. If however, the goods are instead consumed locally, declaration follows and appropriate taxes are paid.

Nevertheless, there is a lot of reconciliation and bureaucracy involved as goods move through the various touch points, and this attracts costs and delays in what should otherwise be an ideal trade facilitation process.

India is a good example where the process does not work well at all. Agreements are made at senior levels of government but are not implemented on the ground. Worse still, some agreements are reversed on a retroactive basis, so uncertainty reigns among importers and exporters alike. Just recently, new free trade warehouse zones (FTWZs) have been established by Arshiya International in Mumbai and New Delhi, with more to come in other locations such as Kolkata, Chennai and Mangalore, all connected by rail corridors serviced by privately-owned rolling stock. This new model will greatly improve the movement of products around India. But there is still a long way to go.

So, it is clear that there are still issues related to trade practices at borders, even though high-level frameworks may be in place. Consistent implementation on a day-to-day basis of import and export clearances remains flawed, so fixing this situation is a priority.

If, using some of the techniques already described, we are able to understand the various types of flow patterns present, we can find a better way to manage them, as with continuous replenishment and lean flows which are largely predictable, then they could be managed at export and import points on a post-clearance basis. Instead

of more government regulation, a government can appoint an auditor to review the transactions retroactively and ensure the correct taxes are paid. Something similar is already done with personal taxes in some countries, where people self-assess and pay their taxes, and these transactions are audited later to check for compliance. In the same way, companies could be asked to self-assess their customs duties, and these would be subject to possible audit at any time. The efficiency of the transaction would increase significantly, and this could become the basis of a new trade facilitation model in which all parties would benefit.

Likewise, for the more volatile/agile component of cross-border flows, although in these cases government agencies would perhaps look more closely at the flows because they represent a risk of revenue leakage to participating governments.

Another possible model is that now in operation with US Customs. After 9/11, all sea-borne containers entering the United States have to be inspected by customs, and this naturally slows commerce down. The US Customs and Border Protection (CBP) agency has introduced the Container Security Initiative (CSI) at foreign ports to pre-screen containers before they are placed on vessels bound for the US. The three core elements of CSI are described below and in the corresponding web link.<sup>5</sup>

- Identify high-risk containers. CBP uses automated targeting tools to identify containers that pose a potential risk for terrorism, based on advance information and strategic intelligence
- Pre-screen and evaluate containers before they are shipped. Containers are screened as early in the supply chain as possible, generally at port of departure
- Use technology to pre-screen high-risk containers to ensure that the screening can be done rapidly without slowing down the movement of trade. This technology includes large-scale X-ray and gamma ray machines and radiation detection devices

The CSI program is now operational at ports in North America, Europe, Asia, Africa and the Middle East, and in Latin and Central America. Indeed, CBP's 58 operational CSI ports now pre-screen over 80 per cent of all maritime cargo imported into the United States.

A similar program is being piloted for air cargo by the US Customs and Border Protection agency; this is known as the Air Cargo Advance Screening programme, and is still in a voluntary stage at the time of writing.

Both programmes are designed to ensure that containers shipped from foreign ports will not need further inspection on arrival in the US port of destination. US Customs officers are implanted in foreign ports to ensure compliance to strict procedures. The overall result is a significant reduction in lead times between origin and destination.

In summary, border clearance for too long has involved minute checking and scrutiny of goods at time of arrival, which has had the effect of inhibiting flows and causing costly delays to both shippers and customers. If we adopt a completely new supply-chain-based global trade flow approach, many of the costs and inefficiencies will disappear overnight. Some of the above-mentioned ideas, and others, are consistent with the direction of many governments that are now actively seeking to reduce regulation and improve the ease of doing business for corporations engaged in their respective countries. Indeed, an index has been created by the World Bank and is regularly published. The index uses several parameters including the trade across borders, the number of documents, cost and time necessary to export and import. Research by the World Bank has found that the effect of reducing regulations on economic growth is strongly positive.<sup>6</sup>

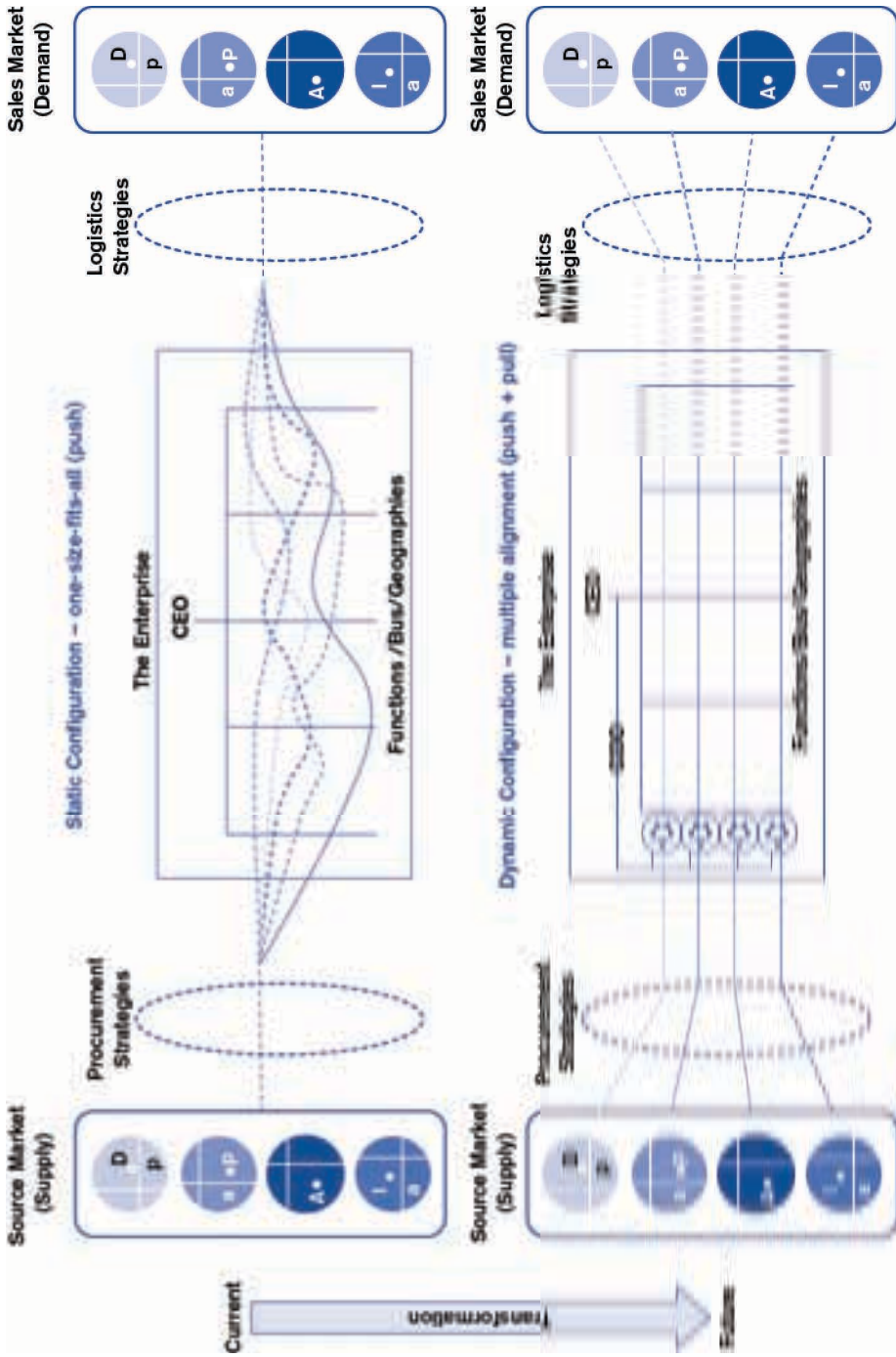
It is significant that the 2012 rankings show Singapore as No. 1, Hong Kong, China No. 2, New Zealand No. 3, US No. 4, Australia No. 15, China No. 91 and India No. 132. Clearly, the latter two countries have a lot of work to do. The equivalent index produced by the World Economic Forum confirms Singapore in the No. 1 spot, and Hong Kong, China No. 2, but the next best Asian country is Australia at No. 17. China is No. 56 and India No. 100, and both countries seem to be slipping in the rankings. See Lawrence et al., (2012).

In summary, we are moving from a static supply chain design that did not previously explicitly include the procurement function, to a more dynamic supply chain design that incorporates the supply side, and is constituted as several different types of supply chain configuration – all focusing on different buying and selling behaviours. The result is a genuine end-to-end integrative supply chain model as depicted in Figure 9.7.

The top half of Figure 9.7 indicates the *status quo* in many companies, where logistics strategies at the demand end, and procurement strategies at the supply end are refined down to a single combination of perceived best practices and relentlessly pursued.

The bottom half of the diagram is where we want to go, where different behavioural segments are recognized in both the demand and supply markets, and discrete supply

FIGURE 9.7: From static to dynamic configurations



Source: Gattorna (2012) (previously unpublished).



chain configurations are designed to run horizontally through the otherwise vertical organization, managed by separate clusters or teams of managers drawn from the vertical functions.

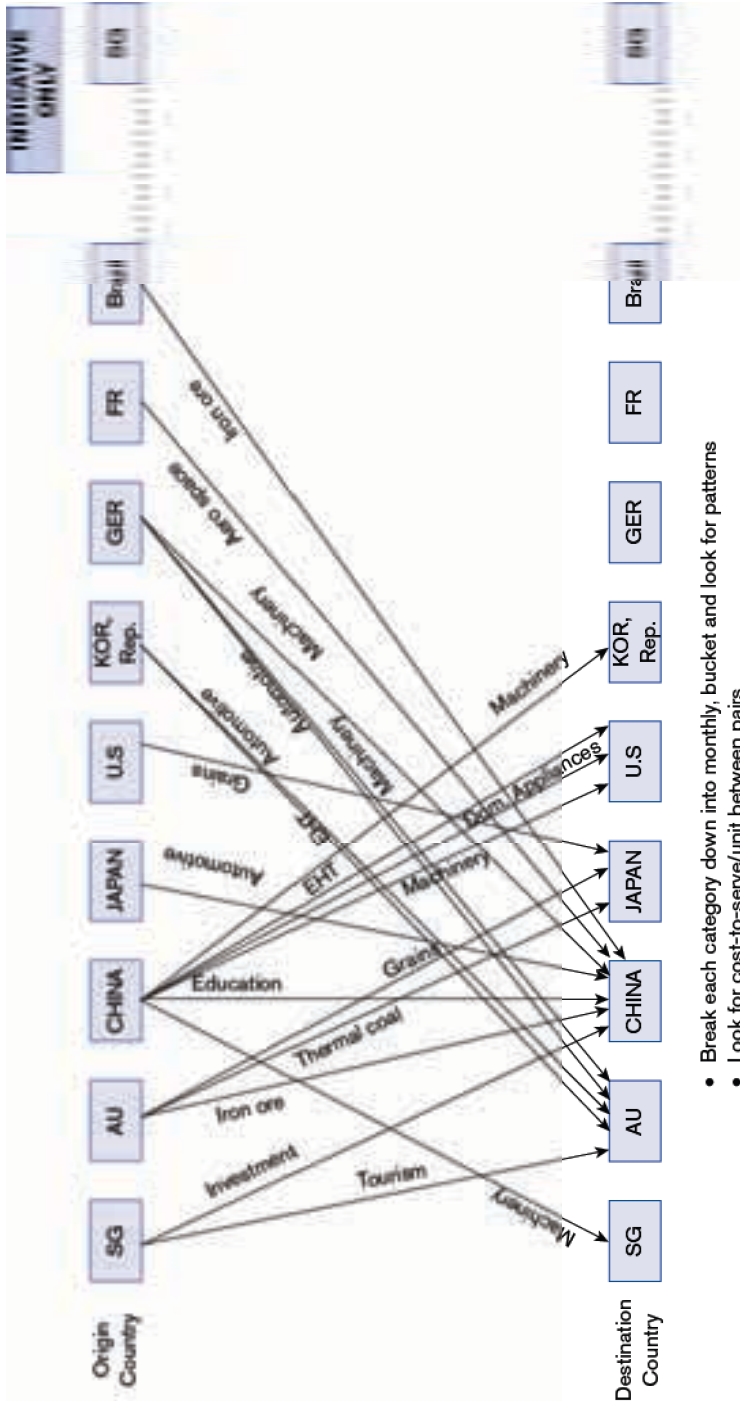
## 9.6. Bringing it all together in a research design

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Given the various insights discussed above, it is now time to bring all the pieces together and devise a possible supplementary methodology to map and manage major trade flows between countries for a specific number of mainstream product categories. The answers from these analyses will provide pointers to appropriate policy formulation discussions with national governments. Refer to Figure 9.8 below when reading the proposed methodology:

1. Select a number of countries from whose perspective we will view trade flows: Australia, Brazil, China, France, Japan, India, Republic of Korea, Germany, Singapore and the United States.
2. Select several mainstream product categories, both in-bound and outbound from the countries nominated in 1. above: e.g., coal, apparel, EHT, automobiles, medical equipment, grains, iron ore, machinery, financial services and tourism.
3. Build a network model of the selected flows in and out of the nominated countries, and place ABC costs on all the feasible links and facilities (including labour).
4. Test a range of scenarios in each network, incorporating constraints such as capacity at certain points; different lead-times; government customs duties and tariffs; government subsidies/incentives; account for any bilateral trade agreements in existence; where certain functions are carried out along specific supply chains; impact of production/logistics clusters; carbon footprint and sustainability; and other similar considerations. Then test the same scenarios without these constraints present, and note the difference in lead-times and cost.
5. The aim is to understand what the cost/unit is along various supply chain network pathways, under varying conditions and to seek the optimal solution for the total network under review.
6. At the same time these flows of products can be analysed using coefficient of variation (CoV) techniques to reveal if there are any layers of identifiably different volatility and if so, how this impacts on the cost of each network flow under review.

FIGURE 9.8: Bilateral import/export trade flows (by key major product/service category)



- Break each category down into monthly, bucket and look for patterns
- Look for cost-to-serve/unit between pairs

Source: Gattorna (2012) (previously unpublished).

7. The outcomes of this research will likely reveal preferred pathways for certain product-origin-destination combinations, and using sensitivity analyses, how these are impacted by different regulatory conditions imposed by respective governments. It is suggested that the best and worst countries on the Employment Trends Index (ETI) Index are compared and contrasted.
8. Finally, taking all the above analyses into account, new business models can be devised that rely less on external regulation, and more on self-regulation combined with compliance audits.

## 9.7. Recommended policy changes

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As a result of the above analyses, it will be possible to develop and recommend a new range of policies that the WTO can initiate among the top 20 trading countries, in the first instance and beyond as these policies are phased-in and are seen to work in a positive way to support more efficient trade flows between trading countries.

1. Recommend self-assessment or fast-track import procedures involving customs duties for those destination country-product category combinations where the flows are consistently predictable, year-by-year, eg. thermal coal from Australia to Japan; the taxes from these flows should also be quite consistent.
2. Recommend customs focus more on the “irregular” imports to ensure revenue is not lost. However, these will often involve short lead times, so additional personnel manning may be necessary to avoid delays; both 1. and 2. Will be subject to compliance audits.
3. Recommend a range of productivity initiatives to destination countries which are low-rated countries on the “ease of doing business” index, eg., China and India.
4. Recommend ways to increase and expand the United States CSI initiative beyond the 58 global ports currently participating. In particular, a similar initiative could be started between pairs of non-US ports around the world. The aim should be to smooth the passage of containers to 80 per cent of trading nations.
5. Recommend to major trading countries such as India and Brazil, and to certain African countries, exactly what priorities in terms of infrastructure investment would have the most positive impact on their respective economies.

6. Recommend to the top 20 pairs of origin-destination trading nations to introduce a common method of measuring and taxing carbon footprint that they are individually and jointly responsible for.
7. Recommend to the laggards in the top 20 trading countries, tax reform that will speed up trade-flows across their borders and within (across state borders).
8. Recommend that the WTO undertake research at the company level aimed at influencing multinational companies to change their internal organization designs to better facilitate the horizontal flow of goods and services along the supply chains that they are part of. This recommendation is based on the contention that change must take place inside trading companies as well as countries if many of the ideas outlined in this paper are to be realized on the ground. The mantra is: “there will be no change unless there is pressure for change”, and the WTO has the means to apply such pressure.

## 9.8. A final word

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In the end, because we now live in such an inter-connected world, the best solution to freeing up complex supply chain and trading networks around the world will likely involve a mix of new and modified regulations plus a range of completely new and innovative non-regulatory initiatives. Getting that balance right is the challenge that lies ahead for the WTO. The lessons to learn from the content of this paper are that we must break down the aggregate numbers involved in trade flows, and better understand why they are and what they are. After all, it is the decisions of personnel along enterprise supply chains that in aggregate underpin these numbers.

A finer alignment with customers and other influential stakeholders will drive productivity improvements at every point. In addition, tax revenue collection will also be more targeted and therefore more efficient, and lead times more competitive for shippers – a win-win for all parties involved in global, regional and national supply chains.

## Endnotes

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**1** Keith Oliver, Booz & Company. He first used the term in public in an interview with Arnold Kransdorff of the Financial Times, 4 June, 1982.

**2** The term ‘Infomediary’ was first coined by John Hagel and Marc Singer in their book, *NetWorth*, Harvard Business School Press, 1999.

- 3 For more detailed information of this unique case, refer to Gattorna (2010).
- 4 Further details available in Gattorna (2010).
- 5 [http://www.cbp.gov/xp/cgov/trade/cargo\\_security/csi/csiinbrief.xml](http://www.cbp.gov/xp/cgov/trade/cargo_security/csi/csiinbrief.xml)
- 6 'Doing Business report series- World Bank Group'. Available at: [www.doingbusiness.org/documents/growthpaper\\_03\\_17.pdf](http://www.doingbusiness.org/documents/growthpaper_03_17.pdf).

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# 10 Supply chain connectivity and trade in Asia

**Mark Goh**

## 10.1. Introduction

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The term logistics is an ancient one. Historically, the military has been lauded as the key underpinning example for good logistics practices, given their emphasis on good movement practices and operational excellence. Good logistics practice can be taken to denote the set of activities undertaken to ensure the smooth passage of goods and services from one location to another, relying on supply liaison officers to provide the necessary connection between stakeholders in a convoy. Indeed, it is the very adept use of logistics (both hard and soft) that has provided certain military forces with superior competitive advantage, the result of which is well documented in history.

Today, the realm of logistics has been expanded well beyond the simple movement and control of a convoy. We have replaced the term “logistics” with the more fashionable term “supply chain management”, though it is of no less importance. To many an experienced participant, the supply chain is perceived as an integrated and interconnected process through activities, nodes and actors to transport and facilitate the trade of goods and services for both enterprise and economy. There is a growing acceptance of the need to view the supply chain holistically and on an end-to-end basis, including the returns. There are obvious reasons for doing so, which we will elaborate later.

The role of supply chain management is simply to manage the supply line, now interconnected as a chain, from source to destination and back. Given the nature and speed of trade today, there is an attendant need to focus on the cost-to-serve and the time-to-value for goods and services. In this regard, improving trade logistics naturally involves ways and means to improve the flow efficiency through either reducing costs along the chain or improving the timelines of delivery (APEC 2009). There are also

other imperatives for contemporary supply chains, given the recent developments in this arena. First is that of making the supply chain more secure through better protocols for goods transfer. Second is about guaranteeing the reliability of delivery by reducing the uncertainty factor in either supply or demand risk. Both of these considerations naturally require some form of reasonable connectivity between the stakeholders to communicate or ensure safe passage during transit, and we will return to this area later. According to an article by LaLonde (2003), connectivity ought to be a core principle of supply chain management, other than those of collaboration, synchronization, leverage and scalability.

In the context of global production networks and global value chains, which is another province of study in itself, the notion and practice of connectivity is indeed an important principle. Berenbeim and Shakya (2011) note that as global production networks advance under the effects of globalization, the transnational enterprises are increasingly engaging central and regional governments on the performance and availability of the “at the border and beyond the border” aspects of their supply chain notably on the issues related to logistics infrastructure, connectivity and regulatory environment. Today, these global buyers and producers of goods and services are no longer passive beneficiaries but are very active partners in all stages of industrial development which include the identification of industrial operations bottlenecks, formulation of policy measures to address them and collaboration in taking remedial action. However, in the developing countries, challenges still exist for the export shippers and producers of goods more than for the firms that import goods into the country. There is already a keen awareness that good supply chain management practice and seamlessness throughout the chain is a source of firm competitiveness. Hence, there is a growing reliance on benchmarking transport and logistics cost and time, given the increase in global production sharing and the shortening of product lifecycles. Good connectivity should eradicate any unnecessary informal cost and non-value time.

## 10.2. Brief overview of work on supply chain connectivity

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Much of the traditional literature on supply chain management has sought to focus on the integration effort within the various functions of the firm (Turkulainen, 2011) or to focus on the integration of different enterprises within a supply chain (Frolich and Westbrook, 2002). The existing literature is replete with studies that indicate that



collaboration between firms leads to improved operational performance (Lockström et al., 2011). More recently, there has been a renewed focus on upstream and downstream collaboration with customers and suppliers, especially for those who operate internationally where the barriers to trade are imposed. This shift came about as a result of the greater awareness of the impact of logistics on trade (trade logistics) and the growing acceptance of the global value chain concept.

Connectivity, in itself, has also been studied in the academic literature, albeit scantily. Hoffman and Hellström (2008) have investigated the connectivity construct in the supply chain management literature. Specifically, they identify the connectivity construct as being informed by information and technology, and it can occur at two levels – in the organization and in the logistics system. Our interest in this paper is focused on the logistics systems level. There is some literature available on articulating the benefits of good supply chain connectivity such as Holloway and Rae (2012) who found that expediting the delivery of imports into a country through the exemption of goods with value of under US\$ 200 from customs duties (and hopefully with no inspections needed) can yield US\$ 5.9 billion in revenue for the economy through faster commerce. This is equivalent to 0.086 per cent of the GDP of APEC (Holloway and Rae, 2012). At the same time, Holloway and Rae (2012) also provide a timely reminder that the greatest beneficiaries are the small and medium enterprises (SMEs) that face more challenges in completing customs formalities. This agrees with Hummels (2001) who has noted that simplifying import procedures can help to ensure timely inbound shipments to an enterprise's market. These SMEs do not have the time, money and dedicated business units for customs clearance and value tax reporting.

### 10.3. Trade and growth nexus in Asia

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According to the estimates provided by APEC (CIE, 2009), a one per cent increase in the ratio of trade to GDP would lead to a 2 to 3 per cent increase in per capita income. Further, the World Bank has reported that improving trade-related transparency can increase trade by 7.5 per cent or US\$ 148 billion. In short, growing uninterrupted trade is beneficial to any economy or country. For Asia, and APEC in particular, this is of special importance given the current economic climate in Europe and North America. Many countries in Asia are already recognizing this finding (see Figure 10.1) and are focusing on liberalizing their trade regimes to provide for greater economic sustainability.

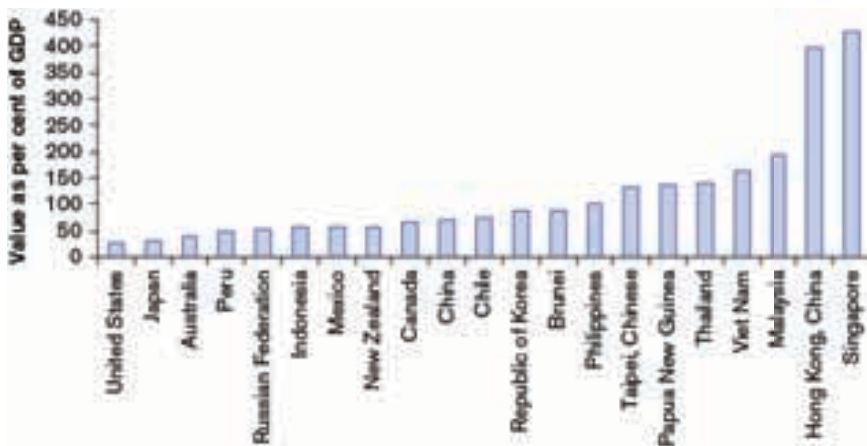
Much of the trade in APEC is focused on components and parts, high-tech electronics and automotives (Athukorala, 2010). Indeed, as stated in the literature, many of the APEC countries provide a strong and dense network of trade either in parts, components or finished goods for these three industrial sectors. For the smaller and open economies such as Hong Kong, China and Singapore, where trade forms close to 400 per cent of GDP, good connectivity is essential.

### 10.4. Supply chain trade nexus

There is increasing recognition today that a strong link exists between supply chain connectivity and international trade. Indeed, the better the connectivity within the supply chain and between supply chains, the higher the prospects for enlarged global trade. With globalization and the emphasis of the WTO on a freer and more open economy, the supply chain will become truly global and with this comes an attendant challenge. The challenge is that of providing reliable, efficient and robust connectivity within and between supply chains to ensure a seamless and smoother passage of goods and services.

On this aspect of supply chain connectivity, it is worth noting that there are many different supply chains operating from Asia, in Asia and throughout Asia, serving the industries for intermediate and finished goods. Each industry's supply chain would

**FIGURE 10.1: Value of trade as per cent of GDP**



Source: Penn World Tables (2011).

have its unique logistical requirements, be it in packaging, customs declaration or shelf life. Table 10.1 presents a general description of the logistical requirements of key industries in Asia (Seráfica et al., 2009).

In fact, for many enterprises and industries, ensuring resilient and reliable supply chain connectivity is critical to the flow for goods and services and hence trade. A product may originate in one country, travel to other countries in a region for value adding (see Global Value Chains) and then back to the original country for final touch-ups before being sold to a destination market, which can be global or regional at the same time, in the event of a new product launch. Figure 10.2 shows an example of such a flow for an electronics product. Clearly, any unnecessary dwell time (measured in terms of the time spent at a node or transit country) has an obvious impact on the enterprise's potential earnings. Supply chain connectivity is thus critical for firm performance, even within a single country

Take the case of India. There, it has been reported that vehicles are slowed down or stopped even at state border crossings. Crossing from one state to another is a regulatory event, consuming up to 15 per cent of all transport time and adding 15–20 per cent to the total cost. Even though value-added tax has been established, border permits are still required. This has obviously impeded the flow of goods and

**TABLE 10.1: Logistics requirements of key industry requirements**

Industry	Characteristics	Logistics requirements
High-tech (including electronics)	Short product life, fast time to market, high trade in components (intra-industry trade)	Faster mode of transport, less bulky packaging, faster clearance for next assembling or production, geographical fragmentation of production process requires highly reliable transport
Apparel	Seasonal, high obsolescence, prone to theft	Fast response to market, good IT system to connect to manufacturers and customers, intermediate storage facilities and security for high-value items
Automotive	Large supplier base in Asia, fragmented system of communicating, much outsourcing, many smaller tier-three SMEs, form lifeblood of some countries such as Thailand and Indonesia.	Good network to move parts around, mutual recognition of commodities or parts, standardized bills of lading
Food	Quality, perishables, reliability of supply	Security, safety, RFID tagging, coolport technology
Chemicals	Highly transport intensive, large supply base in Asia (China, Thailand, Singapore)	Reliable and secure ocean transport, good understanding of dangerous goods management during transit

Source: Seráfica et al. (2009).

(Manufacturing supply chain map)

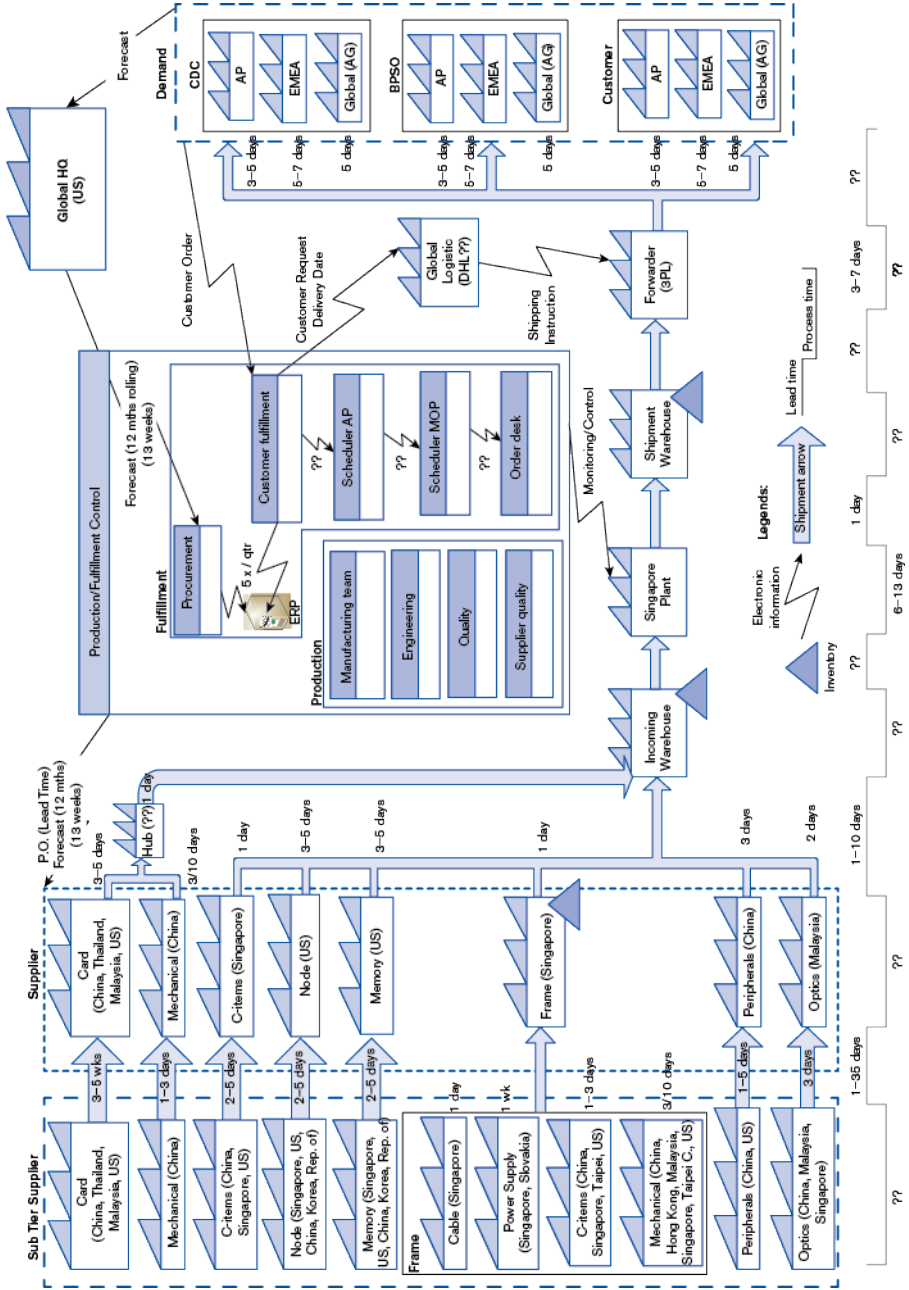


FIGURE 10.2: Value chain side of a business

Source: SIMTech and own creation.

services and is a clear obstacle to connectivity. The net outcome from a commercial perspective is a much slower rate of travel of 30 km per hour and higher freight costs for producers and customers (Berenbeim and Shakya, 2011). Thus, trade logistics costs are much higher than desired and India's LPI standing is diminished. Hufbauer and Wong (2011) report that the *de minimis* threshold is a good indicator of logistics performance, as determined by the World Bank's Logistics Performance Index (LPI). Put simply, the better the *de minimis* level, the better the LPI score, and hence the better the connectivity.

## 10.5. Supply chain connectivity in Asia and APEC

So what exactly is supply chain connectivity and how should connectivity feature in the context of the end-to-end supply chain? In simple terms, connectivity pertains to the sustained ability to link different actors and arcs or trade flows in the supply chain to ensure that goods and services can flow freely from one location to another, either within a country, regional or internationally. Connectivity is clearly critical to supply chain performance not just in terms of cost and time but also regarding safety. We provide another example here.

In the food supply chain, Hoyos (2011) has reported that connectivity between supply chains is difficult to achieve given the need to develop better connections between suppliers and buyers who reside in developing and developed countries. Now, food is a peculiar product. First, the longer the time food products take to get to market, the greater the likelihood of perishability and also of contamination if improperly handled, especially for refrigerated products which must conform to a strict temperature regime during distribution (Asthana, 2009). A 10 per cent reduction in delivery lead

**TABLE 10.2: Supply chain infrastructure and location and criticality**

	Supply chain infrastructure	
	Hard (physical)	Soft (policy, systems)
Behind the border	Roads, warehouses	ERP, SAP systems
At the border	Ports (sea and air)	EDI, TradeNet, customs compliance
Behind the border	CFS, FTZ, bonded logistics parks	Licensing and regulations of trade and transport

Source: Serafica et al. (2009) and author's own creation.

time can help to expand the exports of these time-sensitive products by more than four per cent. This is important for countries which are developing economies and highly reliant on food as their source of income. Likewise, for countries that are dependent on food for sustenance, it is also critical to ensure timely connectivity so that consumers do not have to bear the burden of unnecessary wastages and factor-production inefficiencies along the chain.

In this regard, when one speaks of connectivity, the usual reference is to infrastructure. Serifica et al., (2009) embrace a deeper notion of connectivity and its relation to logistics performance. Infrastructure can be hard or soft, and it has its own degree of criticality depending on where it is located along the supply chain. For this purpose, we will highlight the sort of infrastructure, behind the border, at the border and immediately beyond the border.

## 10.6. Challenges to connectivity in Asia

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Typically, when one refers to hard infrastructure, it usually pertains to the assets of high fixed cost such as large distribution warehouses and ports to store, buffer or transhipped stock to manage any supply or demand uncertainty. At the border, this can represent seaports and airports such as in many Asian countries. However, this physical infrastructure may require significant public-funding support and warrant some private-public partnership arrangements. For the less-developed countries, this presents a challenge. In addition, connectivity at the border also includes other assetized equipment such as gantry cranes for terminal handling at the port, airfreight handling equipment including different temperature-control regimes ranging from  $-28^{\circ}\text{C}$  to  $18^{\circ}\text{C}$ , and joint container pallet loaders. Beyond the border, this could take the form of traditional container freight stations where cargo needs to be de-bulked and on-shipped to its final destination. Some of the infrastructure requires heavy commitment and development cost that poorer countries find difficult to afford.

All this equipment naturally carries a cost. For physical infrastructure, determining the right amount and right type of facilities to be used (as for ambient versus cool temperature) and locating them at the right place is important to serve business and trade. Regarding soft infrastructure, there is a mix of public and private sector collaboration in some Asian countries to ensure smooth supply chain connectivity. One prime example is that of the “National Single Window” which is supposed to reduce unnecessary dwell time at the border and expedite cargo clearance through

a green-lane mechanism. Related to this is the implementation of IATA's e-freight initiative which serves to reduce the cost of data entry and verification and also to minimize the time goods spend in the supply chain system through the efficient re-use of data. Soft infrastructure in the form of systems connectivity, harmonization of standards and government regulations could possibly be more critical to ensure smooth and seamless goods passage. The challenge is for governments and their key agencies to agree on the right data to capture and house for tax and revenue collection purposes, without unduly slowing the system. Thus, focusing on improving soft infrastructure could possibly reduce the need for excessive hard infrastructure before the border, at the border and behind the border. It has been suggested that a 10 per cent improvement in flow efficiency in across-the-border operations can boost the GDP of the APEC economies by as much as US\$ 21 billion annually (CIE, 2009). Further, additional jobs would be created to manage the systems once it was in place.

The typical flow of a finished car from an automotive factory in Chongqing (a major manufacturing and transportation hub) to the international port of Shanghai involves a distance of about 2,150 km along the Yangtze River and requires 8 to 11 days barging downstream (see [www.dci-logistics.com](http://www.dci-logistics.com)). A dwell time of one to two days at Shanghai port and then a transpacific sailing time of 20 days on APL Hyundai Hong Kong before reaching Long Beach on the West Coast of the United States would mean a month would be needed for door-to-door transit. This obviously has implications for the cost of capital tied up in the supply chain. Clearly, saving just one day amounts to a three per cent improvement for the China-US West Coast trade lane. Thus, poor connectivity can reduce the choice set of potential factory locations in China.

However, supply chain connectivity concerns all modes of transport, especially in the case of Asia, a continent with landlocked countries, islands and with increasing reliance on inter-modal transport. Good supply chain connectivity thus concerns road network connectivity, air freight connectivity for commercial airlines and cargo freighters, ocean-faring ships and regional lines feeders, inter-island connections and sailings and the hand-off points for the various modes of transport. Yet there still remains one critical element of supply chain connectivity worthy of much attention. This regards the ease of transiting through borders and customs at international and regional gateways.

A 2009 APEC report on supply chain connectivity identified 20 to 30 chokepoints that give rise to supply chain connectivity issues. Two of them can help us to better

understand the challenge to improving connectivity and building the necessary capacity for such (CIE, 2009):

1. The lack of physical capacity or poorly maintained infrastructure: in many parts of Asia there are still countries that lack the physical capacity to provide good air, sea and land freight connectivity. This lack of capacity as evidenced by the lack of proper warehousing or temperature-controlled environment for storage can effectively lengthen a cargo's dwell time and overall transit time. Poorly maintained infrastructure also creates angst for many shippers or logistics providers with old and slow equipment used to move containers and bonded warehouses in dire need of retrofitting with modern technology for better security, screening and safety.
2. Poor, numerous and cumbersome regulations: a report commissioned by the ASEAN secretariat found that there were far too many regulatory requirements (de Souza et al., 2007). This limits the efficiency of clearance and connectivity. The cost of facilitating connectivity at the border has often been alluded to in regional and international forums. There is a need to simplify customs documents and reduce the amount of burdensome inspection due to unfamiliarity with or unclear declaration of goods. This in particular affects the SMEs that form the bulk of all enterprises in Asian countries.

While most of the challenges to connectivity have been addressed with the help of international and regional organizations such as IATA's e-freight programme and the National Single Window initiative promoted and supported by the World Bank and others, the road to seamless connectivity is still a long one.

In this instance, we recall the situation of product returns management. In the interest of environmental sustainability, product returns for the purpose of repairs, remanufacturing and recycling have become an increasingly important part of the end-to-end supply chain. In Asia, there is good growth potential for this line of business. However, placing product repair points in low-cost labour locations such as India and China does not help the cause of connectivity. This is due to policies that countries like China have adopted in an effort to protect themselves from economic dumping, and these policies tend to scrutinize the flow of returned products more carefully and thus delay the repair process. For these product returns, the time back to market and economic serviceability are of the utmost importance to the mining and high-tech industries. Failing to stick to tight timelines can result in a severe commercial



penalty for the enterprise. The challenge for supply chain connectivity is therefore the ability to craft regulations that allow for the smooth passage of a genuine return, from a product intended for dumping in a developing country. Asian countries need to work around these regulations, given their high degree of involvement in the global production network and the proportion of closed-loop supply chain activities.

## 10.7. State of progress on the supply chain connectivity initiative in APEC

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According to its charter, APEC aims to strengthen regional economic integration by removing impediments to trade and investment “at the border”, enhancing supply chain connectivity “across the border” and improving the business environment “behind the border”. It endeavours to improve the operating environment for business by reducing the cost of cross-border trade, improving access to trade information and simplifying regulatory and administrative processes (see [www.dfait-maeci.gc.ca/apec/index.apec?view=id](http://www.dfait-maeci.gc.ca/apec/index.apec?view=id)). We note that connectivity first came to the fore of the APEC agenda in 2001.

We recall the earlier statement that a ten per cent efficiency gain in across-the-border supply chain connectivity would generate jobs for APEC countries and raise the GDP by US\$ 21 billion annually. At the company level, trade reports have shown that a five per cent reduction in the logistics spend (presumably through human resources to manage complex processes, transport and border clearance) has a similar impact on the bottom line as a 25-30 per cent increase in sales (see [www.supplychainconnection.com](http://www.supplychainconnection.com)). Besides, a one-day loss in exports can lead to a loss in export value of one per cent. Clearly, in a global environment rife with uncertainty, improving cross-border connectivity is a big first step for economic growth both in a region and for an individual country. At the policy level, the APEC trade facilitation principles were agreed upon in close partnership with the business community in 2002 and then in 2006. The less ambitious objective then was to reduce the transaction cost by 5 per cent by 2016, taken over two five-year time frames.

At a recent APEC workshop held on improving supply chain connectivity across economies through open and competitive services, several key points were raised and discussed among the business, academic and policy communities (APEC 2010). Particular issues such as regulatory impediments and their cost to supply chain connectivity were highlighted and deliberated upon. These actions serve to highlight

the importance of connectivity to trade, even for services. Clearly, good supply chain connectivity facilitates the trade in goods and services and it has a regional impact. More importantly, it has an indirect influence on growth and development.

To date, 13 of the 21 APEC economies have implemented single-window systems for customs declarations and clearance. Another five APEC members have systems under development. It is worth noting that this progress has been aided by the political will of the governments concerned who are keen to see greater liberalization in trade and services and also fewer impediments to the passage of goods and services at the border. The business community, through the ABAC (APEC's Business Advisory Council), has also helped to project a meaningful and impactful agenda for action. In fact, ABAC has accelerated APEC's supply chain work plan to integrate the supply chain regionally. Leveraging new technologies, ABAC is also responsible for initiating the move of APEC's Single Window concept to a cloud-computing platform. This has helped to defray the cost of operations particularly in implementation and ICT infrastructure, to improve systems inter-operability, to increase ease of access in terms of any time, any place and through any device, to afford greater flexibility to logistics service providers and shippers to do their declarations and also to improve scalability and deployment.

## 10.8. Some lessons learned

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Improving supply chain connectivity for better trade is a journey to be taken with perseverance and patience, as shown by the APEC case. Table 10.3 contains the chronological details of this journey. Some of the key takeaways include: (i) the need and willingness to better share information through the National Single Window mechanisms, (ii) to improve the collection of data, (iii) to accelerate the harmonization of procedures and regulatory requirements particularly customs, and (iv) to spur proactive effort to remove non-tariff barriers. The recipe for success is a tripartite effort involving governmental cooperation, multi-agency cooperation and vested commercial interests.

## 10.9. Moving forward

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We have thus far covered the case of APEC, which hopefully is representative of the situation in Asia. The transit of goods across national and international borders will always be a work in progress for shippers, logistics service providers and regulatory

bodies. The key intent is to manage the flow as seamlessly as possible, keep costs down and make the process as painless as possible. We have seen how connectivity involves the elements of infrastructure – both hard and soft – and the primary roles of each stakeholder in the specific areas of transport services, warehousing, distribution, and data and information management. Speed to market is necessary to ensure timely consumption of the goods and services that are intended for the destination market. In an age of growing globalization, the supply chain lines and linkages will only become more pervasive. Leaving goods to dwell at a certain node for too long without any value creation or addition does not help the business cause. Policy decision makers must share the same view as business so that trade growth will not be impeded by supply chain glitches arising from poor connectivity issues. The connectivity of the poorer countries needs to be brought up to par with the better-connected countries so that everyone can clearly see and appreciate the benefits of good supply chain connectivity. The imperative is to examine the supply chain issues related to the

**TABLE 10.3: Supply chain connectivity effort by APEC**

Program	Start	Target	Intended outcome	Challenge
Trade facilitation	2001	2020	Free open trade and investment in Asia-Pacific	There exist inefficiencies in every link of the supply chain
TFAP (Trade Facilitation Action Plan) I	2002	2006	Reduce transaction costs across AP by five per cent	Not all economies on same level of growth and hence responsiveness.
TFAP II	2006	2011	Focus on first TFAP with a special view to customs and other administrative procedures that hinder (excessive paperwork), delay (burdensome inspection practices) or increase the cost of moving goods across international borders (informal facilitation).	Limited to at-the-border crossing issues. The facilitating issues of the actual movement of goods to and from the border (logistics issues) were missing.
Single Window	2007		Design, build and implement single-window system for APEC members. By 2010, 13 of 21 countries had single-window and five were developing single-window systems.	Single-Window Implementation Guide endorsed only in August 2009 (three years is too long for business)
SCCFAP (Supply Chain Connectivity Framework Action Plan) or CTI	2009	2015	Considered as next generation trade improvement, the focus is on logistics specific issues such transport, communications, and regulatory barriers that affect behind the border costs. Target: ten per cent in supply chain performance by 2015	Results yet to be determined as Phase I (2010–2013) is due in June 2013 for mid-term assessment.

Source: Author's own creation.

movement of goods not just at the border but also from source to destination and return. A *de minimis* regime as suggested by Holloway and Rae (2012) which provides for streamlined border clearance and exemption from customs duties and other taxes clearly helps in ensuring supply chain connectivity at the border.

## 10.10. Concluding remarks

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This paper seeks to highlight the importance of supply chain connectivity on trade particularly for growing economies in the context of Asia. No doubt some progress has been made, but more work lies ahead especially in the tripartite engagement between governments, the business community and international development agencies such as the World Trade Organization, the World Customs Organization and the Asian Development Bank in order to promote greater freedom in the movement of goods and services between, across and beyond borders. We need a more logistics-friendly and business-enabling environment for faster trade flows and greater economic growth.

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