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THE LOGISTICS INSTITUTE – ASIA PACIFIC

REVIEW OF SUPPLY CHAIN IMPERATIVES 2008

A collaboration between

The Logistics Institute Asia Pacific

NUS National University of Singapore

Georgia Institute of Technology

THE LOGISTICS INSTITUTE – ASIA PACIFIC

REVIEW OF SUPPLY CHAIN IMPERATIVES 2008

IN COLLABORATION WITH

FROST & SULLIVAN

A THINK Executive White Paper

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Executive Summary

The Logistics sector is one of the fastest and perhaps most turbulent industries across the world, the Asia Pacific region, and in particular, in ASEAN. This edition of the THINK Executive White Paper Series is an exclusive look at five key imperatives pertinent to supply chains in the Asia Pacific region today. To identify these key imperatives, The Logistics Institute – Asia Pacific and Frost & Sullivan collaborated to conduct an extensive review of more than twenty industry reports and interviews with leading logistics service providers, technology service providers, and consulting firms. These imperatives include:

1. Moving beyond warehousing and transport as outsourced services;
2. Leveraging IT to for greater supply chain visibility and collaboration;
3. Mitigating supply chain disruptions;
4. Engineering green and sustainable supply chains;
5. Integrating the supply chain regionally and globally.

These imperatives were identified to likely have significant influence on industry supply chain practices in both the short and long-term, and will act as a catalyst for future research at The Logistics Institute – Asia Pacific. By exploring salient business issues affecting logistics executives' decision-making across Asian countries, this report aims to provide insights in to industry best practices and cutting edge technologies, help logistics executives to develop optimal solutions relevant to logistics and supply chain challenges, and raise awareness about unanswered questions on these issues.

Introduction

The Logistics sector is one of the fastest and perhaps most turbulent industries across the world, the Asia Pacific region, and in particular, ASEAN. Spanning across the globe, there can be tens of participants in a supply chain network offering various services and functions. To add to the complexity, Asia's supply chain challenges are a unique contrast to those of North America and Europe, differing significantly across immediate borders. These differences can be attributed to contrasting geographic landscapes, rapid economic development in Asia, diverse government regulations, and differing maturity levels of supply chain infrastructure and usage in this region [1, 2]. With such contrasting, unique supply chain challenges, there is no one-size-fits-all supply chain solution that can be applied to organizations in this region.

While the global logistics industry as of 2007 was estimated to be worth US$5.8 trillion, the Asia Pacific logistics industry accounted for US$1.9 trillion and the ASEAN logistics industry, US$0.2 trillion as of 2007. Of the ten countries in the ASEAN region, four countries have witnessed a major increase in the outsourcing of logistics activities in the past few years. These four countries, Singapore, Malaysia, Thailand and Indonesia, comprise the leading four economies of ASEAN constituting the bulk of the logistics industry usage in the region, and will be discussed here in this white paper.

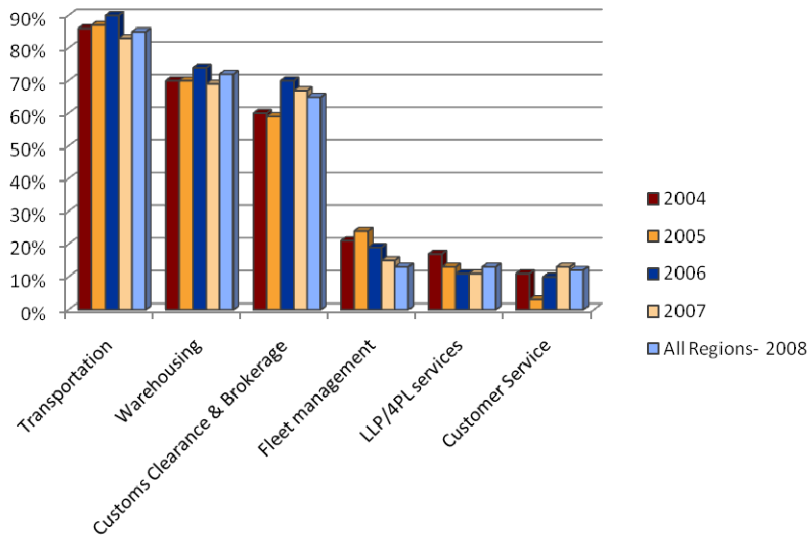
This THINK Executive white paper, a collaborative project between The Logistics Institute – Asia Pacific and Frost & Sullivan, seeks to highlight a number of key imperatives within the logistics space for the region, determine the challenges and opportunities for logistics players in these markets, and identify the research agenda for the Institute. Based on an extensive review of the supply chain literature and industry reports, TLI-Asia Pacific and Frost & Sullivan honed in on five key imperatives that are particularly pertinent to the current and future supply chain environment in Asia Pacific:

1. Moving beyond warehousing and transport as outsourced services;
2. Leveraging IT to for greater supply chain visibility and collaboration;
3. Mitigating supply chain disruptions;
4. Engineering green and sustainable supply chains;
5. Integrating the supply chain regionally and globally.

Imperative #1: Stretch LSPs' service portfolios beyond basic services of warehousing and transport

Today, a large continuum of logistics services are available in the market, from tactical services such as transportation, warehousing and customs brokerage to strategic services such as Fourth Party Logistics (4PL)/ Limited Liability Partnership (LLP) and integrated logistics services. Looking through the marketplace, the tendency of manufacturing companies to outsource only basic services is reflected in the results of the past five years of the Third-Party Logistics (3PL) studies [3-7] which reveal that warehousing and transportation remain the most popular services that customers are currently using (Figure 1). Additionally, strategic services have consistently been less adopted by customers for the past 5 years (Figure 1). These findings suggest that customers are slow to adopt services beyond the basics of warehousing and transportation.

FIGURE 1: LOGISTICS SERVICES CURRENTLY OUTSOURCED (SOURCE : [3-7])

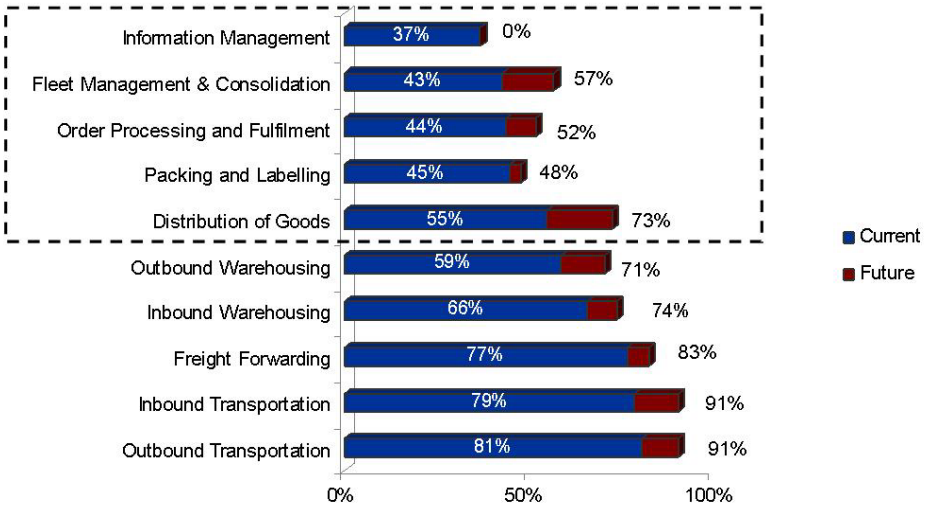


What logistics users seek to outsource

Today, many logistics service providers (LSPs) have the ability to provide a comprehensive portfolio of integrated logistics services to their customers. However, a large number of customers still prefer to keep most of the logistics process in-house, outsourcing only the most basic services of warehousing and transport to logistics service providers. These basic services have relatively low entry barriers, and are often commoditized. As a result, many LSPs focusing on provision of basic services have to compete on price, resulting in smaller profit margins.

With a specific focus on which functions customers outsource in ASEAN countries (Figure 2), as of 2008, transportation services continue to be the most outsourced logistics function across the leading four ASEAN economies: Singapore, Malaysia, Thailand and Indonesia. Outbound transportation is the service outsourced the most, followed closely by inbound transportation. As much as 81 percent of the end-user companies interviewed currently outsource outbound transportation, while 79 percent currently feel the need to outsource inbound transportation services.

FIGURE 2. CURRENT AND FUTURE LOGISTICS SERVICES OUTSOURCED IN THE ASEAN REGION (2008 – 2010)
(SOURCE: FROST & SULLIVAN)



Taking a closer look, Figure 2 also splits the logistics functions into 2 categories. The top five functions, highlighted in a dashed box, are categorized as specialized functions. These functions include fleet management, order processing, information management packing and labelling, and distribution of goods. The last five functions of the figure are basic functions which include transportation, warehousing and freight forwarding. The figure also depicts the extent to which outsourcing of logistics functions are likely to increase by 2010. As is evident from the chart, basic functions are extensively outsourced at present in the four leading ASEAN economies and the trend is likely to continue in future.

However, the percentage increase in outsourcing of specialized logistics functions is expected to rise above basic functions in future. For example, outsourcing of distribution activities is expected to increase by around 18 percent, and demand for fleet management is expected to increase by 14 percent in 2010 due to the influx of technology and software-based services into cargo and vehicle tracking. Reverse logistics is likely to attract demand from end-user companies and is expected to be one of the high growth functions in future, with around 40 percent of the industry inclined to outsource it. Information management, however, is not likely to witness much increase in the next two years. The findings also underline the growing demand for these specialized logistics functions amongst end-users in the near future, thereby providing greater market opportunities to LSPs of such services.

Within the basic functions, a rise in demand for inbound transportation (12 percent rise) is expected to be higher in future as compared to outbound transportation (10 percent rise), with as much as 91 percent of the industry planning to outsource both inbound, as well as outbound transportation, in the future.

What is offered in the LSP service portfolio?

LSPs are most commonly categorised in terms of the services they provide on a continuum of asset-intensive activities (such as warehousing and transportation) to information technology (IT)-intensive activities (such as logistics and supply chain information systems) [8]. These services can also be categorised into basic services, value-added services and strategic services. The product portfolio of most of today's larger logistics providers is typically

brimming with a number of these services and many tend to fall in the value-added and strategic services category.

A firm's competitive environment and value proposition are dependent on the organizational development and market strategy, and in particular its IT strategy that is easily controlled by the company. As a result of current changes taking place in the LSP landscape, three business models for LSPs can be identified: Yield Innovator, Portfolio Innovator and Orchestration Innovator (Figure 3) [8].

FIGURE 3: ELEMENTS OF EMERGING LSP BUSINESS MODELS (SOURCE: [8])

ELEMENTS OF BUSINESS MODEL	YIELD INNOVATOR	PORTFOLIO INNOVATOR	ORCHESTRATION INNOVATOR
ESSENCE	Innovation in basic services	Innovation in value-added services	Innovation in strategic services
ASSET/IT INTENSITY	Asset Intensive	Asset/IT Intensive	IT Intensive
GEOGRAPHIC REACH	Local to Regional	Regional to Global	Global
VALUE TO CUSTOMER	Reduce transaction cost	Reduce total logistics and transportation costs	Reduce total costs and improve time to market
RELATIONSHIP TO CUSTOMER	Short-term	Mid-term	Long-term
SERVICE DIFFERENTIATION	Low (commoditized)	Medium (Due to differentiation in IT)	High
NUMBER OF PLAYERS	Many	Fewer than Many	Many
SERVICES OFFERED	Basic	Value-Added Services	Strategic
INNOVATION STRATEGY	Autonomous	Between autonomous and systemic	Systemic

The most basic LSP business model is the ***yield innovator***. Yield innovators have led the way in logistics outsourcing through asset-based services such as inbound and outbound transportation, freight forwarding and warehousing. Due to their low service level differentiation and basic service level offerings, most of these services have attained the status of commodity-like services.

To remain competitive in the market, these LSPs innovate on basic services using IT tools and by providing bundled services. The IT-based services provided by the yield innovators include warehouse and distribution center management, transportation management execution, web-enabled communication and visibility tools. In addition to providing IT and bundled services, basic LSPs increase their reach from local country to regional levels by undergoing joint ventures or mergers with companies to provide their services over a larger geography. These LSPs are typically the members of the networks driven by the 4PLs, but they do not drive the network themselves.

Therefore, being situated at the low end of the network, the services provided by yield innovators are autonomous in nature. Their strategy is to attract customers with low-cost service on a short-term level.

At the mid-range of LSPs are the ***portfolio innovators***. Portfolio innovators have emerged in a service vacuum created by the yield innovators. They may or may not own assets, but they tend to be quite IT-intensive. The essence of the portfolio innovators is that they innovate by providing IT-based value-added services, such as customer order management, Internet-based transportation and logistics markets, RFID and asset tracking, and transportation management planning. As portfolio innovators do some networking with the shipping companies and customs department, their innovation strategy would be somewhere mid-way between being autonomous and systemic in character. Portfolio innovators develop solutions tailored to meet the unique and special needs of each customer.

At the top end of the LSPs spectrum, offering a complete range of logistics' services, are the ***orchestration innovators***. These LSPs provide strategic supply chain management services which optimize the entire supply chain and offer a long-term solution to users. The essence of the orchestration innovators is that they innovate by providing strategic IT-based services, such as supply chain planning and supplier management systems. While orchestration innovators do not typically own assets to offer basic services, even if they own assets such as warehouses, these basic services are not among the main services provided by them. Furthermore, as orchestrators manage the whole supply chain, they tend to have a global reach. Their innovation strategy is also quite systematic since they are driving networks with shippers, LSPs, and shipping agencies. For example, these LSPs may decide to provide one-stop services and offer 4PL-like solutions, such as virtual collaboration tools, to

manage the full logistics requirements of large companies worldwide. Virtual collaboration tools would enable individual parties to collaborate in a virtual domain and rein in their competencies for the benefit of the customer. Moreover, virtual integration would enable companies to operate with others as if they were acting as a single, vertically integrated company.

The outsourcing service gap

Most end-user companies find outsourcing to service providers an advantage from an information-generating and decision-making standpoint. For example, outsourcing logistics activities to service providers facilitates decisions pertaining to factors such as modes of transportation to be adopted, type of multi-modal transportation, and warehousing locations. Secondly, its assists in reducing the overall logistics costs and improves reliability of the organizations' inventory management systems, thereby aiding supply chain optimization. With most manufacturing industries facing tough competition, onus is on the supply chain networks to create a differentiation factor among companies. As a result, companies prefer to focus on their core competencies and opt for employing services of logistics companies to manage their basic supply chain functions efficiently. Following are key focus areas for end-user companies when outsourcing their logistics activities:

- Outsourcing logistics requires scaling up the supply chain infrastructure within the company, thereby assisting in overall logistics efficiency.
- Outsourcing adds an unbiased element towards framing supply chain strategies.
- Outsourcing facilitates an easier and cost-effective adoption of various specialized functions within logistics, distinct from basic transportation and warehousing functions.

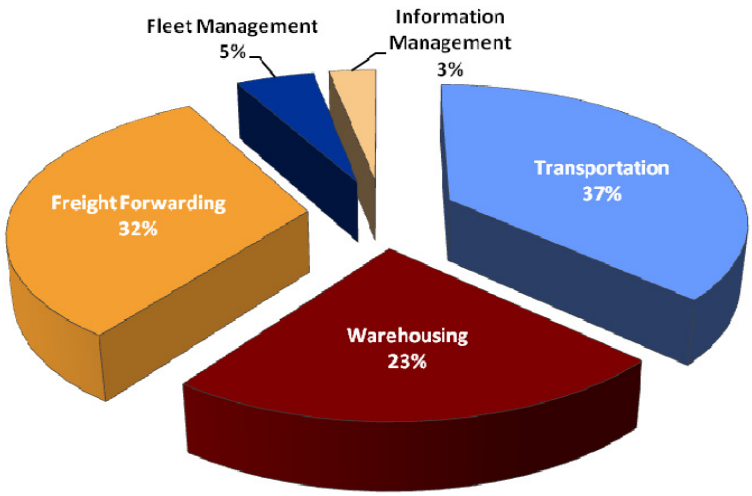
However, while strategic supply chain management services provide differentiation and improve responsiveness of customers' supply chains, many companies worldwide, including in Asia, still are not willing to relinquish a higher level of control and flexibility to LSPs and open themselves up to increased risk. This may be associated with a lack of trust between users and LSPs that is often associated with a lack of visibility in the supply chain. As discussed in the following section, basic services, such as transportation, are easily outsourced and require only basic levels of trust. Therefore, this gap poses opportunities for those LSPs with capabilities to better understand their customers' needs and to adapt their business model to better serve users.

The cost factor in ASEAN

Logistics cost comprises 14.2 percent of the total sales in the ASEAN region. As the pie below illustrates, maximum costs are incurred on transportation services, followed by freight forwarding and warehousing, therefore signifying the dominance of basic function costs over specialized ones (Figure 4).

FIGURE 4. COMPONENTS OF LOGISTICS COST (2008)

(SOURCE: FROST & SULLIVAN)



Comparing the four leading ASEAN economies for logistics costs (Figure 5), Indonesia suffers from highest logistics cost of 19.2 percent of the industry's total sales. The primary reason for greater logistics costs in Indonesia is the large numbers of small, local logistics companies which do not possess the capabilities of managing more than just basic logistics functions such as transportation and warehousing. Secondly, infrastructural issues, such as poor road quality and road connectivity problems, contribute to increased time to transport cargo, therefore increasing costs and making customs clearance a challenge in this region. In comparison, Thailand has 17.3 percent logistics cost, the second highest cost percentage of the four ASEAN countries we assessed. Like Indonesia, it suffers from the same problems of infrastructure and high level of unorganized industry participants' presence.

FIGURE 5. LOGISTICS COST OF FOUR ASEAN COUNTRIES BY SERVICE (SOURCE: FROST & SULLIVAN)

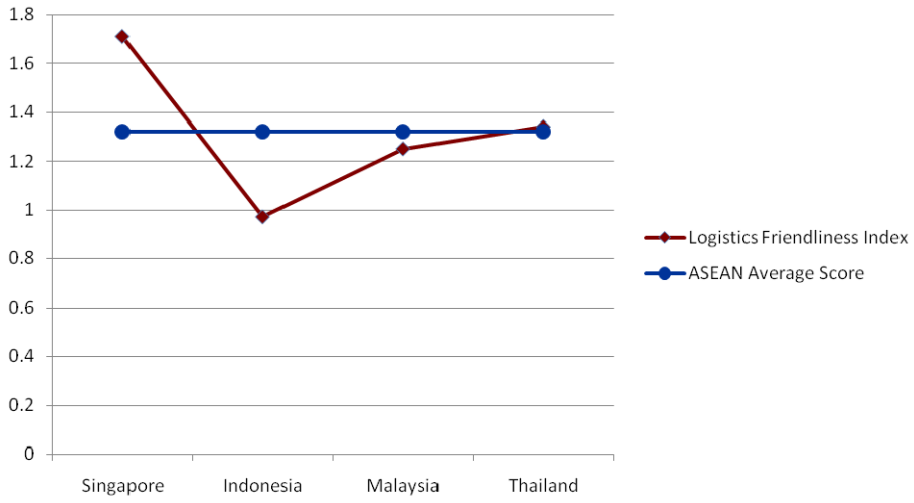
COUNTRIES	LOGISTICS COST AS % OF TOTAL COST	LOGISTICS COST PERCENTAGE BREAK-UP (LOGISTICS SERVICES)				
		Transportation	Freight Forwarding	Specialized Services	Warehousing	Information Management
Indonesia	19.2%	36.4%	49.5%	2.4%	9.8%	1.9%
Thailand	17.3%	45.0%	7.7%	5.1%	41.5%	0.7%
Malaysia	12.2%	43.5%	23.4%	3.8%	23.7%	5.6%
Singapore	8.0%	19.3%	41.4%	7.1%	28.9%	3.3%

Transportation costs are high in most ASEAN countries except Singapore (Figure 5). This is because transportation is the core logistics function of these countries, with other logistics functions revolving around it. In particular, the strategic locations of Indonesia and Singapore make them transit destinations for cargo movement, resulting in higher volumes of freight forwarding. On the other hand, in Thailand and Malaysia, being geographically larger countries, transportation plays a dominant role.

Other costs are not monetary, and instead refer to the cost of time and efforts in dealing with barriers to smooth logistics. Asian governments continue to invest more and more money into infrastructure in the hopes of further leveling the supply chain playing field with their Western counterparts. However, there continue to be unique challenges in this region. The ASEAN countries can be ranked on the 'logistics friendliness' index which includes measures on regulations, foreign investment, and infrastructure (Figure 6). From this analysis, it can be seen that Singapore, with its modern logistics practices, is quite unique as the only one of these four ASEAN economies with significantly lower barriers for free trade in logistics services.

> *"Supply chains in the Asia Pacific region are comparatively fragmented, spread across countries with disparity in the social, economic, political, and geographic environments. The multiple country borders in Asia make customs clearance more of a challenge than in large countries such as the U.S. and in economically unified countries such as those in the European Union."*
>
> - Alfred Goh, Vice President, Supply Chain Logistics Global Customer Solutions, DHL Asia Pacific

FIGURE 6. RELATIVE LOGISTICS FRIENDLINESS INDEX FOR FOUR ASEAN COUNTRIES (SOURCE: [9])



The lack of logistics friendliness in ASEAN contributes to difficulty in users working with LSPs to provide more strategic logistics services, emphasizing the need for these barriers to be overcome before users are willing to move beyond basic LSP services and before integrated supply chains can be successful in the region.

Research Questions for Imperative #1

Given the hesitation of customers to outsource higher-level services, it is important to reach a deeper level of understanding as to why users are not outsourcing more of their logistics and what factors and innovative services would entice customers to outsource more than just basic warehousing and transportation. Despite the LSPs' ability to manage the whole supply chain and their range of services and global reach, a limited number of companies prefer to utilize orchestration services offered by LSPs. Questions that remain include:

1. Why is there a disconnection between what LSPs offer and what do customers seek out as services from them?
2. What factors affect users' outsourcing decisions?
3. What are the dynamics affecting growth and innovation in the LSP industry?

Imperative #2: Leverage IT to increase supply chain visibility and collaboration

A lack of critical supply chain process visibility has been identified as the number one concern for global supply chain in the Global Supply Chain Benchmark Report by Aberdeen group [10]. Visibility tools help to integrate the supply chain, increasing the responsiveness, making participants more agile to respond quickly to changing environmental condition, and providing increased control over the supply chain.

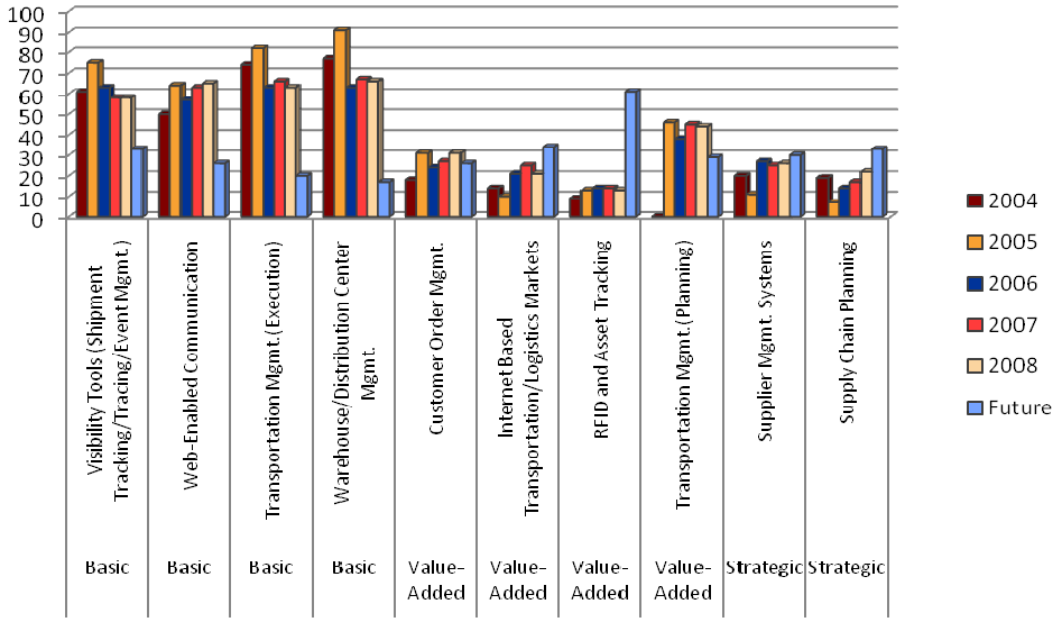
A recent Singapore government report [11] stated that information technologies are critical enablers in making Singapore a Supply Chain Nerve Centre and will provide visibility, intelligence and flexibility to manufacturers, logistics companies and infrastructure operators. This message is echoed globally as IT capabilities of logistics players have been the subject of much discussion in forums around the world.

Current and future IT-based services

From 2004 to 2008, global IT usage continues to see a shift in technology adoption towards increased IT-based services in logistics. Value-added services (such as internet-based transportation and logistics markets and RFID) and strategic services (such as supplier management systems and supply chain planning) are particularly popular (Figure 7) [3-7].

In 2008, web-enabled communications and visibility tools are considered highly favored IT services by logistics users, closely followed by warehouse and distribution centre management and transportation management and execution. To note, this diagram does not predict basic IT-based services to be less popular in the future, but instead suggests that these services will have been implemented by most companies by a certain point, and therefore, in the future will be utilized primarily by late adopters and new enterprises.

FIGURE 7: IT-BASED SERVICE 2004-2008 (SOURCE: [3-7])



IT adoption in ASEAN

Among ASEAN countries, outsourcing of specialized services and information management is significantly low, demonstrating the immense opportunity for logistics service providers to move into this market, as well as the adoption of new and specialized IT services in these countries. According to a recent study by Frost & Sullivan on four ASEAN countries (Singapore, Malaysia, Thailand, and Indonesia); Singapore has the highest level of usage of specialized services such as IT and software-based services for vehicle and cargo tracking, RFID and bar coding; while Malaysia has the highest outsourcing volumes for information management. The high adoption of IT in Singapore can also potentially be correlated to its high levels of economic development and logistics friendliness mentioned in the previous section. However, the extent of outsourcing of specialized services is still significantly low as compared to Western countries, presenting sizeable business opportunities for providers of such specialized services.

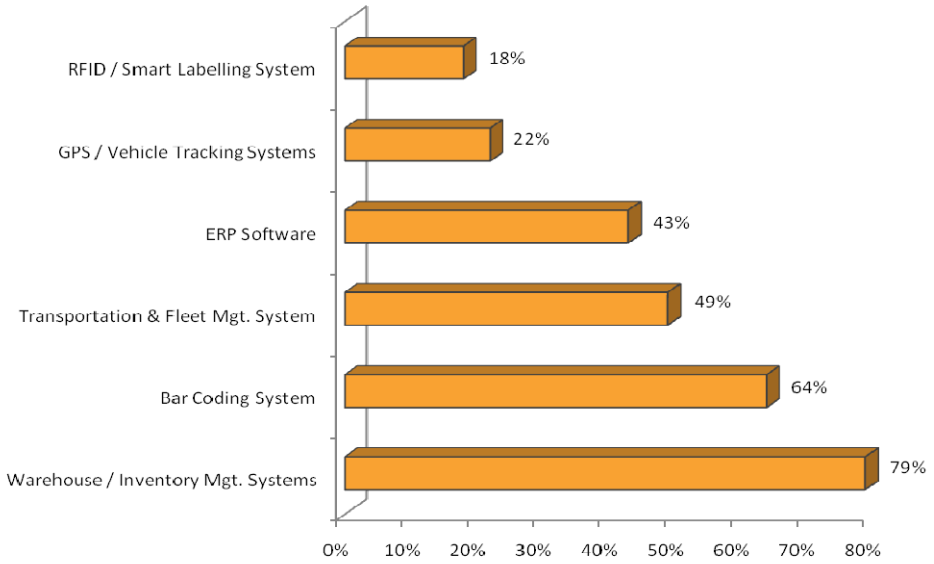
A lack of adoption of these technology services has recently led to a rise in logistics cost in these countries (Figure 5), ranging between 8 to 20 percent of total costs. However, they continue to be successful in reducing logistics costs. Around 70 percent of the logistics players in Thailand were successful in recording a lower logistics cost in 2008 as compared to 2007, the reasons being improving road network and the constant development in transportation infrastructure. Malaysia recorded the second highest success rate, with 63 percent of the logistics sector witnessing lower costs. Singapore's success rate at reducing logistics costs in 2008 stood at 52 percent while Indonesia followed closely with a 47 percent reduction.

The result of this success in reducing costs in all the four countries can be attributed to the slow, but steady adoption rate of specialized IT and software-related solutions. Although the adoption rate is low at present, it is expected to increase by almost 50 percent by 2010 with availability of competitive technology and higher levels of outsourcing to organized service providers. Furthermore, as these economies continue to develop, IT will be a contributing factor to an improvement of these countries' logistics friendliness. Moreover, more companies are moving towards outsourcing integration, and will need to adopt more IT to streamline and increase visibility in their virtually integrated supply chain.

One way of reducing logistics costs is to employ the use of specialized technology or software-based solutions. Solutions such as warehouse management, vendor management, inventory management, bar coding, integrated transportation and fleet management systems, GPS and ERP software-based solutions and RFID and smart cards are gradually being offered as part of routine logistics services by service providers.

For the overall ASEAN region, warehouse and inventory management systems are the most outsourced specialized services, followed by bar coding. GPS, RFID and smart cards are the least used technology services in the region (Figure 8). While these basic solutions are being engaged regularly in the ASEAN region, others that are more expensive, such as ERP, RFID and smart cards, continue to be employed regularly only by multinational logistics companies.

FIGURE 8: TECHNOLOGY SERVICES OUTSOURCED IN ASEAN REGION (SOURCE: FROST & SULLIVAN)



LSPs' solution footprint

For LSPs to differentiate and remain competitive, the primary business functions and components that they aim to provide tend to be higher level services such as customer channel management, business operation management, tools facilitating communication and collaboration, and IT infrastructure. LSPs are already aware of the many business operation management tools currently available on the market. These include: transportation management and warehouse and distribution centre management software that support these business functions.

Today, the tools used by LSPs are supported by large IT infrastructure investments. While largely focused on internal and material management, the next step of development is likely to be the adoption of external-based tools, such as web-enabled communication tools and customer channel management.

By using such operations management tools, logistics players are likely to be more responsive to customer demands. Furthermore, the advanced software might facilitate the communications and collaborations among supply chain partners and between service providers and customers. This in turn has the potential to improve overall supply chain effectiveness and efficiency, and provide more customer value.

"To be competitive in this flat and open world, LSPs should leverage technology to create differentiation for themselves. LSPs will need to have an integrated and yet modular solution built on open standards to provide key integration and collaboration capabilities - creating an infrastructure for a single source of transportation information to be available to all parties in the ecosystem and enabling these parties to have complete visibility into the whole supply chain."

- Philip Kwa, Specialty Sales Director
  Transportation Solution, Oracle Singapore, ASEAN

Visibility in the supply chain

Visibility is critical for supply chain players to integrate and streamline their supply chain, no matter whether they adopt pull or push strategies. In every part of the supply chain, more visibility can help companies to decrease inventory costs by managing the timing of each stage of the supply chain. Furthermore, having increased visibility will allow different participants of the supply chain to coordinate, allowing them to become more agile and responsive to changes in customer demands.

Ideally, all supply chain partners would adopt visibility technology to make an expensive technology investment worthwhile. However, investing in visibility technology tools is often expensive, and especially during the current economic crisis, companies are reluctant to spend. Therefore, companies have to trade-off between responsiveness gained by an open visibility supply chain and its hefty costs. As a result, the lack of open visibility technology tools in the supply chain continues to be a contributing barrier in the adoption of an integrated supply chain.

Research Questions for Imperative #2

Having sophisticated information technology may help a LSP to differentiate its offerings from the other players, but the question remains whether more sophisticated IT is really required by the market. Is there demand for higher end services supported by complex IT software packages? Therefore, the questions that companies must ask before investing in sophisticated and costly Information technology tools include:

1. What IT is required in the LSP technology portfolio?
2. What should the IT process blueprint of a LSP or user cover?
3. How does IT embrace collaboration, visibility, and agility in improving speed to market?

Imperative #3: Manage the growing threat of disruptions in the supply chain

Supply chains are intricate networks involving hundreds of companies. These interactions pose several risks both internal and external to the supply chain. For example, operation risks, or internal risks, are those that occur across the supply chain network, including supply and demand risk. However, with globalization, supply chains are less isolated and the shocks of external disruptions, such as diseases like SARS, or natural and man-made disasters, such as tsunamis, terrorist attacks, and economic crises are occurring more often. While disruption shocks occur less frequently, it is usually unpredictable and difficult to manage, thus making the impact of them huge. As today's supply chains are global, when one part is affected by a shock, the entire chain is affected.

> *"One of the biggest challenges in integrating a supply chain is coordinating multiple forms of services and products in a global landscape. Customers are often hesitant to put all their eggs in one basket. For these customers, delivering hybrid solutions that add value to a customer's logistics practices whilst reducing risk is the next best step."*
>
> - Darren Wedding, Vice President, Product Management Logistics, Schenker (Asia Pacific) Pte Ltd.

To assess what types of risks companies in Singapore felt were most pressing, The Logistics Institute – Asia Pacific recently studied several firms in Singapore, mostly logistics providers, on supply chain risk and security [12]. Major risks in supply chain management were identified (Figure 9).

FIGURE 9: MAJOR RISK FACTORS IN SUPPLY CHAIN MANAGEMENT (SOURCE: [12])

Major Risk Factors in Supply Chain Management

- Sudden loss of demand due to an economic downturn
- Volatile demand/decline in demand
- Increase in customers' bargaining power
- Inventory holding costs
- Product obsolescence
- Risks due to dependability and conformance to delivery schedule

The results of the study showed that the main risk factors in supply chain management are related to demand management and information management risks. These risks include a firm's inability to collect on receivables due, particularly when the customer is facing poor financial conditions, and fluctuations in demand that require the supply chain to remain flexible and agile.

However, there are several risks that are external to the supply chain. For example, with a lack of visibility and increased outsourcing in global supply chains, intellectual property risk has also grown. Competing firms often outsource to the same manufacturer and there is increased chance that information will be made available to the wrong parties. Inaccurate forecasts of what the market demands can result in a surplus or shortfall in supply, and given the current worldwide economic turbulence, currency and demand fluctuations increase companies' risks.

Impact analysis of risk factors

Major risks factors can be categorized into macro level risks, demand management risks, supply management risks, production or service management risks, and information management risks. In the survey, the impact and frequency of each type of risk was proposed to each firm. The values of impact were ranked from 1 to 4, where 1 denotes very low, 2 is minor, 3 is serious, and 4 is a catastrophic impact. Similarly, the values of frequency were ranked as 1, 2, 3, and 4 to represent rarely, sometimes, often, and very frequent the frequency of the occurrence of risks, and can be shown in a risk score matrix (Figure 10).

FIGURE 10. RISK MANAGEMENT ACTION (SOURCE: [12])

	Very Low	Minor	Serious	Catastrophic
Rarely	1	2	3	4
Sometimes	2	4	6	8
Often	3	6	9	12
Very Frequent	4	8	12	16

Three different kinds of risk management action zones were defined, i.e.: a green zone, a yellow zone, and a red zone according to the impact of the risks. If the value of risk was less than or equal to 2, the risk then belonged to the green zone; if the value of the risk was greater than 2 and less than 7, then it belonged to the yellow zone; if otherwise, it belonged to the red zone.

For the risk action zones, we can see that firms only need to document and monitor risks if the risk falls in the green zone. In the yellow zone, they must take preventive measures as well as writing proper documentation for risk management. However, if the risk lies in the red zone, firms must take extensive management essential actions. Survey respondents were required to choose the appropriate values of impact and the likelihood of the occurrence of each type of risk for their company. Shown in Figure 11 is a summary of what companies feel are the risk action zones for common risks in today's business landscape.

FIGURE 11. ANALYSIS OF MAJOR RISKS (SOURCE: [12])

Type of Risk	Risk Action Zone		
	Green Zone	Yellow Zone	Red Zone
Sudden loss of demand due to an economic downturn	16.9%	71.0%	12.1%
Volatile demand / decline in demand	13.3%	67.5%	19.3%
Increase in customers' bargaining power	25.3%	62.7%	12.1%
Risks stemming from an excessive inventory: Inventory holding costs	32.5%	51.8%	15.7%
Risks stemming from an excessive inventory: Product Obsolescence	38.6%	47.0%	14.5%
Risks due to dependability and conformance to delivery schedule	37.4%	53.0%	9.6%

Current supply chain risk mitigation practices

Each company operates in a unique environment, and as a result has unique risks. Therefore, it is nearly impossible to create a generic risk mitigation strategy that would be applicable to all companies or industries.

As noted previously, each company needs a unique plan to mitigate risk. However, there are a few generic risk management strategies that can be considered at different stages of the supply chain. Supply chain operations can be improved through coordination and collaboration with upstream or downstream partners, make their own internal processes more agile and responsive to changing market demand, and increase sharing of information through the supply chain.

Improving supply chain visibility helps each stakeholder understand the current supply chain situation and allows them to remain agile to sudden change. For example, should there be a sudden drop in demand, companies can respond by first adjusting their product pricing through sales and promotions, and over time, adjust their production.

Increased visibility in the supply chain also reduces the impact of a security breach [13]. Companies using LSPs are concerned about the security regarding the potential for theft and terrorism, as well as vulnerability for product tampering. Physical security for material goods can be improved, but with the additional factor of increased visibility, reports and alerts can be sent out and security procedures can be swiftly implemented if necessary.

Technologies, such as RFID, can be used to provide some of these answers quickly, however, may be hindered by lack of deployment and cost.

The key to risk mitigation is to be proactive. The use of IT with configurable event management capabilities can facilitate this – by generating an automatic agent that can send an alert when an unforeseen event occurs, thus allowing users to proactively rectify the situation before it gets worse.

Research Questions for Imperative #3

While executives feel that they have heard the term "Risk Mitigation" and strategies have been created to mitigate shocks, there is sometimes a lack of understanding on how to manage and implement these strategies.

1. Given the increased occurrence of disruption risks, how can companies anticipate and mitigate such risks in their supply chain?
2. Who bears the cost burden for security?
3. Disruption risks are low probability and high impact. What trade-off strategies might be deployed for mitigating such shocks?

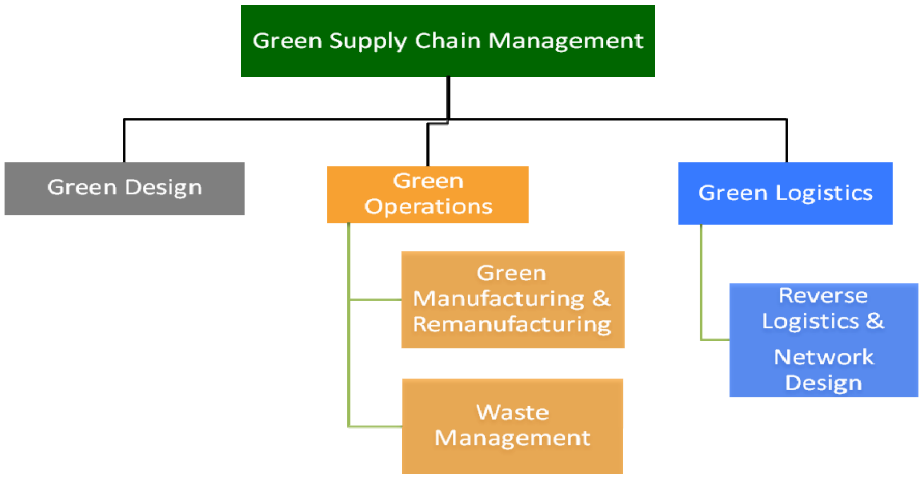
Imperative #4: Go green and stay sustainable

Traditionally, costs, responsiveness and service levels have been the objectives of an efficient supply chain. With increased scrutiny of the effect of businesses' supply chains on the environment by customers, investors, environmentalists, and society in general; going green in the supply chain has become increasingly important to maintain good business. However, given the complexity of modern, global supply chains, creating sustainable supply chains is more of a challenge than meets the eye. Not only is it important to know that your own practices are green, but it is also key that your suppliers and distributors from around the world are mindful of their corporate social responsibility.

'Green' and 'sustainable'?

The words 'green' and 'sustainable' are often discussed at length. However there are many definitions for each. The general consensus is that "Green" means environmentally friendly and differentiated, but may also suggest increased costs, less competitiveness, and ultimately, less long term viability. "Sustainable Green," on the other hand, means that the efforts to "green" the supply chain are also economically and socially viable over the longer term. The concepts of social impact, while important, are only emerging now, and here, we focus mainly on the carbon footprint. There are a number of stages of the supply chain that can be greened, from green design to fulfilment and reverse logistics to waste management (see Figure 12) [14].

FIGURE 12: MAJOR CATEGORIES OF THE SUPPLY CHAIN THAT CAN BE "GREENED" (SOURCE: [14])



> *"In a manufacturing environment, reducing carbon emissions typically requires costly investments in new technologies. Not so in all supply chains. Lowering your carbon footprint can be achieved by making your supply chain more efficient, translating into reduced overall logistics costs."*
>
> - Marcus Robinson, Director, Supply Chain Management, Asia Pacific Region, Maersk Singapore Pte Ltd

While it may initially be challenging to develop and implement a sustainable supply chain, starting to look for ways to improve standards now may help meet investors' and customers' expectations, and can also decrease costs and carbon emissions in the longer term. Companies are trying to become at least carbon neutral by outsourcing carbon emission-generating activities, such as transportation, to logistics service providers with the hope that LSPs in turn will offer optimal ways to reduce the footprint. Logistics service providers have stepped up to the challenge and are also trying to become more carbon neutral by creating programs that allow them to reduce their carbon footprint through consolidated load optimization and optimal modal connectivity.

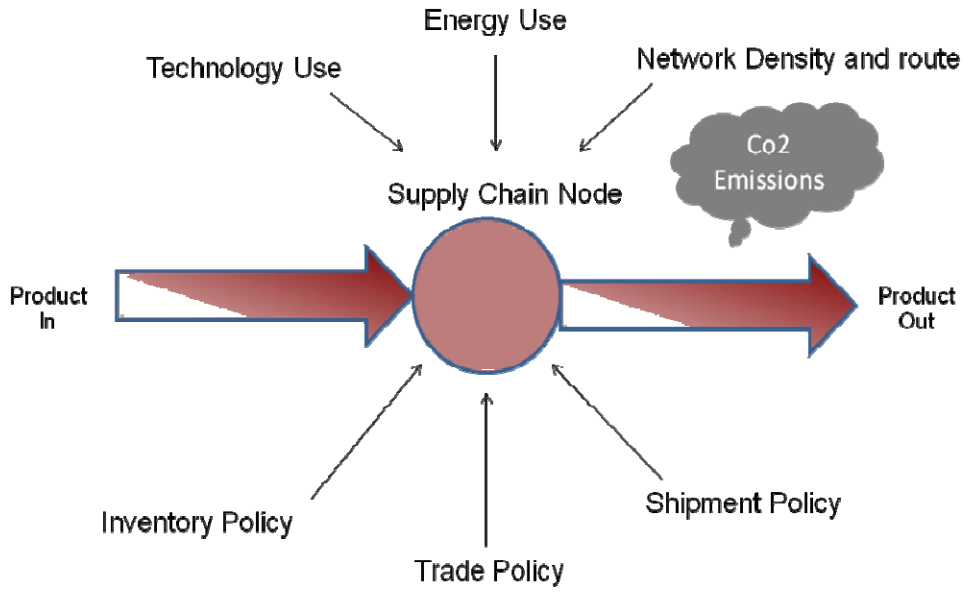
Motivations of green supply chain management

Green supply chain management begins with recognizing some of the contemporary environmental dimensions, such as carbon emissions, demand on energy and other natural resources. Armed with specific knowledge of various dimensions and drivers of green supply chain management, companies need to formulate both high level and detailed planning of complete logistics chains on an end-to-end basis. The green supply chain management practice is in addition to the traditional supply chain practices of cost reduction, inventory minimization, and network optimization.

There are a number of factors that affect management of carbon emission in a supply chain (Figure 13). Total carbon emissions of the manufacturing stage can be measured from direct and indirect emissions of different manufacturing stages, and total carbon emissions at the distribution and consumers' sides depend upon the type of packaging used, trade policy, consumer density, and the level of reuse. In general, the heat flux drivers influencing a supply chain control the emission from upstream to downstream in a supply chain.

As the product enters in each node of the supply chain its heat flux increases due to various influencing factors. This increase in intensity is dependent on the performance of the product and process drivers of supply chain as shown in Figure 13. Controlling this flux and carbon emission requires us to monitor the entire supply chain and redesign it based on the approach.

FIGURE 13. FACTORS AFFECTING MANAGEMENT OF CARBON EMISSIONS IN THE SUPPLY CHAIN, WHERE INCREASED SHADING DEPICTS INCREASED HEAT FLUX (SOURCE: [15])



"The logistics industry must find ways to reduce their reliance on carbon producing inputs. Third party logistics providers, governments, manufacturers and end users all play an important role in this endeavour to ensure we are not just moving the responsibility to other participants in the supply or value chain. There are many new ideas and technologies that are available and under development to create sustainable supply chains, but it is those companies like DHL and some of its customers, that have made solid commitments for carbon efficiency improvements, that are investing and finding the real sustainability benefits now."

- Richard Winnall, Senior Vice President, Operations, APAC, DHL Exel Supply Chain Singapore Pte Ltd

Determining supply chain tradeoffs when mitigating carbon emissions

Currently, there are a number of operational and tactical strategies designed to mitigate the carbon emissions across the supply chain (Figure 14).

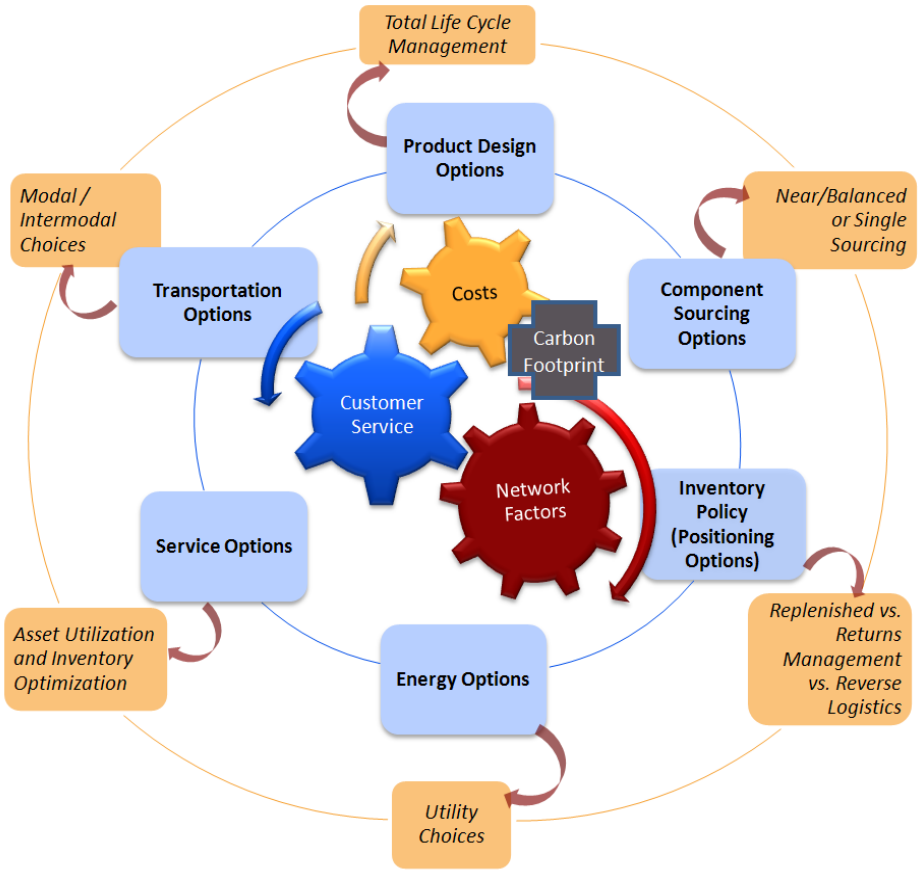
FIGURE 14. STRATEGIES TO MITIGATE CARBON EMISSIONS ACROSS THE SUPPLY CHAIN (SOURCE: [15])

Strategies to Mitigate Carbon Emissions Across the Supply Chain
Supplier selection drastically reduces the emission
Green supply and purchasing policies
Environmental regulations on trans-shipment
Carbon regulation at manufacturing level
Green innovation at logistics services level
Reducing inventory and increasing visibility at distribution level
Green packaging and distribution strategies
Reduce, reuse, recycle policy at consumption stage
Creating awareness among consumers against carbon emissions

However, there are a number of factors that should be considered before implementing these strategies. A decision cycle can be used to illustrate the tradeoffs of various key factors that impact supply chain performance and the carbon footprint (Figure 15). Costs, customer service, and network factors are at the core of this cycle, driving decisions on various options in the supply chain. Traditionally, only once these factors are analyzed are environmental factors considered. Cost, customer service and network factors need to be balanced, environmentally, economically, financially, technologically, socially, and legally to create a sustainable business model that meets the basic objectives of business.

However, if the carbon footprint of a supply chain was considered at the same level of importance as costs, customer service and network factors, only then would a supply chain become sustainable. Until then, there remains the trade off among cost, quality, carbon emissions and service.

FIGURE 15. SUPPLY CHAIN TRADEOFFS



Research Questions for Imperative #4

Corporate awareness on social responsibility has created immense changes across the manufacturing and business communities. However, there is a long way to go to create a sustainable supply chain environment. Questions that still exist surrounding this topic include:

1. What are the major factors and innovations driving logistics companies to go green?
2. What is the current level of sustainable green in the logistics industry? What is a good methodology to determine how green a company is?
3. What is the cost of going green?

Imperative #5: Integrate the supply chain regionally and globally

> *"Many LSPs are viewed by their customers as providing 'execution-based operations.' The key question is what sustainable valued-added services can they develop to further meet the logistics and supply chain needs of their customers."*
>
> - Rodney Strata, Industry Principal, Transportation & Logistics Industry Solutions Group, APJ, SAP Asia Pte Ltd

Integrated supply chains are considered to be one of today's most strategic opportunities for companies to gain cost savings, improve supply chain visibility, optimize enterprise alignment, and ultimately, gain a competitive advantage. In an integrated supply chain, a single strategic business unit co-ordinates activities across a corporation (including different geographies, business units and divisions) for planning and management of all activities involved in their end-to-end supply chain processes. This includes direct sourcing and procurement, manufacturing, and all logistics management activities.

There are two major types of integration in the supply chain. Horizontal integration is the acquisition of business activities at the same level in the value chain, while vertical integration is where a firm owns a large extent of the chain from upstream suppliers to downstream distributors.

Focusing on vertical integration, there could be two types of vertically integrated supply chains: asset-based and virtually integrated supply chains. If companies choose to manage their entire supply chain, the degree of integration is normally positively associated with the infrastructure and network the company owns. On the other hand, if companies choose to outsource components of their supply chain while maintaining control over the supply chain, very often they would leverage advanced information technology (such as visibility tools) to virtually integrate the company's supply chain. While the benefits of the virtually integrated supply chain are obvious, including better control and speed-

to-market, it requires a high level of mutual trust between logistics users and the logistics service providers.

Categories of integrated value chain

Most often, value chain models are used to reflect various organizational functions and the interrelations between the primary and supporting activities to achieve a business goal. While this view has been quite popular, most manufacturers today are part of different sub-vertical supply chains. For example, a high tech manufacturer supplies to both electronics and automotive customers, each of which has a unique set of challenges that are coupled with the complexity of managing multiple geographies and entities. The traditional value chain model is thus required to be mapped on to the various supply chain processes in order to get a better understanding of the common challenges and strategies needed to address them, making it increasingly difficult to integrate supply chains. To gain manufacturing insights, IDC has outlined the following categories of key value chains:

- Engineering-oriented value chains
- Technology-oriented value chains
- Asset-oriented value chains
- Brand-oriented value chains

Engineering-oriented value chains (EOVC)

Engineering-oriented value chains are characterized by segments that are driven by complex products such as in automotive, aerospace, industrial machinery, farm/construction equipment, medical equipment, consumer durables and transportation equipment.

EOVC segments usually have fairly steady demand and some variation in their manufacturing processes, but have their greatest challenges in attenuating supply variation. Typical supply chain strategies include reduction of material, manufacturing and logistics costs; improving responsiveness; as well as establishing deeper collaboration with various supply chain partners.

Technology-oriented value chains (TOVC)

Technology-oriented value chains (TOVCs) have a physical flow of goods that are dictated by the iterating cycles of key underlying technology (for example, processors) and include segments such as semiconductors, electronic manufacturing services (EMS), high tech equipment, and consumer electronics.

TOVC value chains can have high levels of variation in supply, manufacturing, and demand. Typical supply chain strategies include improving timeliness of decision-making through better demand sensing and supply management; be responsive to changes in the marketplace; and cost-reduction.

Asset-oriented value chains (AOVC)

Asset-oriented value chains (AOVCs) are characterized by large investments in property, plant, and equipment and include segments such as chemicals, pulp/paper, metals, and construction materials.

AOVC value chains deal with modest levels of variation in supply, manufacturing, and demand. They are characterized by commoditized products produced from inflationary raw materials at production facilities representing substantial capital investment, which are subject to severe regulatory oversight. Typical supply chain strategies include cost-reduction through better utilization of plants, improved decision-making and reduction of time-to-market for new products.

Brand-oriented value chains

Brand-oriented value chains (BOVCs) are characterized by branded products that serve consumer markets. BOVCs include segments such as health and beauty, food and beverage, and apparel.

BOVC value chains have fairly stable sources of supply but must manage highly volatile demand. Typical supply chain strategies include cost-reduction; timely decision-making through better business intelligence and be responsive to the marketplace and customer preferences (demand management).

Outsourcing integration?

Traditionally, most companies have chosen to integrate their own supply chains. However, as noted in Imperative #1, with the growth of LSPs and their extensive service portfolios, companies have more choices than ever before in finding help to integrate their supply chains. However, integration of services by logistics service providers is ranked low among logistics services current outsourced (Figure 1). While three-quarters of the LSP users in the 2008 3PL Study intend to consider logistics providers for overall integration of systems and services rather than trying to accomplish integration internally [7], a limited number of users have adopted LLP and 4PL services to-date. This suggests that while higher-level integration of logistics services has the potential to be a future trend, companies still need to be further convinced to take the initiative to integrate.

There are several critical barriers which make customers unwilling to use logistics service providers as integrators. Globally, these barriers include the loss of overall flexibility and loss of control [7]. Even well-developed North American and European markets are not isolated from challenges. As highly congested and mature markets, they still require government initiatives to update infrastructure to accommodate changes in demand. Furthermore, Asia is made up of multiple geographies. Each country has a different culture, language, and network of relationships, which have traditionally been much stronger than regional or global structures and systems [2]. As a result, it is more difficult for logistics users to manage their own supply chain across Asian countries. However, the regional diversity could also be a potential opportunity for large logistics service providers. With exposures to various Asian countries and broad infrastructure network, they are able to serve their customers better by providing integrated logistics services in Asia, especially in cross-border logistics services.

Understanding the growth of logistics service industry

The past five years have seen unprecedented levels of mergers and acquisitions in the logistics industry. Two major trends that are evident from the recent developments affecting growth in 3PL landscape include consolidation and redefinition.

The 3PL landscape is consolidating by way of mergers, acquisitions, joint ventures and strategic alliances. Through consolidation, 3PLs are redefining themselves mainly in two ways, namely, geographical expansion and operational expansion. A large percentage of consolidation activity among 3PLs is due to geographical expansion. 3PLs are prompted to go global in search of competitive markets, as well as to secure and enhance their market position and easily address the concerns of their global clients.

A significant percentage of 3PLs are also expanding their operations through consolidation in an attempt to become a one-stop-logistics solutions provider by providing value-added and strategic services to their clients. Moreover, some 3PLs are also integrating vertically, thus strengthening their core businesses. This gives them an opportunity of becoming global market leaders in specific logistics services such as transportation and shipping. Thus, we see a surge of vertical and horizontal expansion among 3PLs in a wake to improve their market position and customer service. Drivers and inhibitors for growth in the logistics service industry are seen in the figure below (Figure 16).

FIGURE 16. CAUSAL LOOP DIAGRAM FOR 3PL GROWTH (SOURCE: [15])

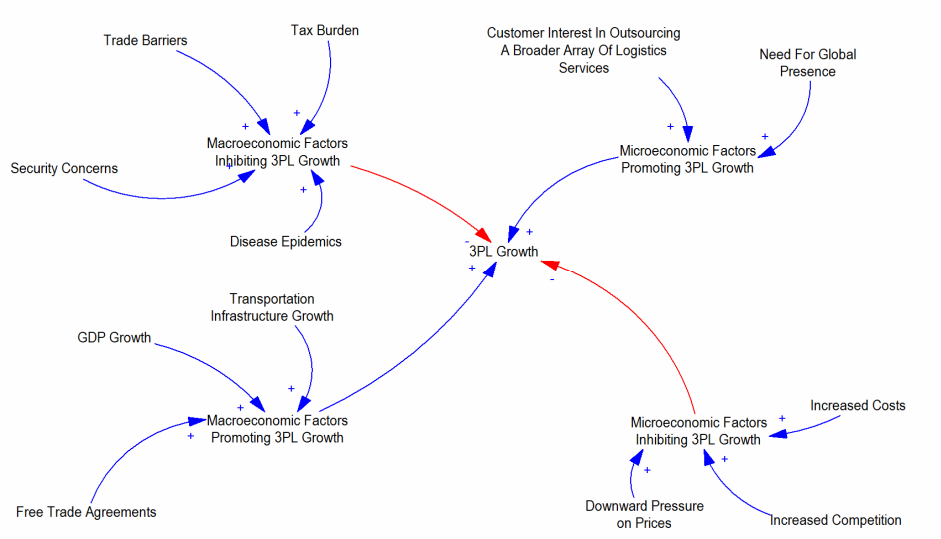


Figure 16 displays the four main drivers for 3PL growth. They are:

1. Macroeconomic Promoters
2. Macroeconomic Inhibitors
3. Microeconomic Promoters
4. Microeconomic Inhibitors

Microeconomic factors are factors that are controllable by the firm and its customers while macroeconomic factors are factors that deal with conditions beyond the control of the firm and its customers. The following inputs are used for the macroeconomic promoters: transportation infrastructure growth, GDP growth, and free trade agreements. For the macroeconomic inhibitors, we use the following inputs: presence of trade barriers, security concerns, tax burden, and disease epidemics, while macroeconomic inhibitors are linked mainly to trade growth and GDP growth. By directly changing the values for the corresponding promoters, we can indirectly model the impact of these inhibitors. For the microeconomic promoters, we use two factors: user interest in outsourcing a broader array of logistics services and the user's increasing need for 3PLs to have a global presence. The main microeconomic inhibitors considered are increased costs, increased competition, and downward pressure on price.

The model explains the different policy scenarios under various conditions and provides the opportunities in using a cross-functional approach to model complex business situations. 3PLs can plan for the long term viability of their firm by seeking to diversify their service offerings to exploit these niche markets and make their firms be either successful in the long-run or position themselves for potential mergers and acquisitions.

Research Questions for Imperative #5

There are several generic reasons why companies prefer to or prefer not to outsource integrated logistics (for example, ease of managing supply chain, cost reduction, efficiency, responsiveness, and visibility). The following questions have been raised by this discussion:

1. How does the complexity of supply chains affect logistics outsourcing and integration?
2. How does economic development and growth in the ASEAN region affect supply chain integration?

The Road Ahead: ASEAN

This report has outlined a number of key imperatives that will affect the logistics landscape in the ASEAN region. We highlight them here.

The outsourcing trend for the logistics industry still emphasizes basic services (or termed tactic services in some industry reports), mainly including warehousing and transport services. In fact, the basic service market is relatively well-developed and competition-intensive. To compete in this market, many logistics service providers have to adopt a cost leadership strategy, which would likely reduce the average profit margins for the logistics industry. However, some leading logistics service providers still manage to differentiate themselves by laying emphasis on offering specific-designed services tailored to customer needs and providing value to customers.

The outsourcing trend for the logistics industry also points towards higher adoption of integrated or specialized services. These include services such as order processing, fleet management and inventory management. The ever-growing demand for customized warehousing and the demand for specialized services, which are expected to rise by 50 percent, leave logistics service providers faced with opportunities to offer a complete range of logistic services – basic as well as integrated/specialized, to the ASEAN region. This integrated and specialized service market is expected to be a promising market for service providers for possible higher profit margin.

To prepare themselves for this promising market, LSPs should further leverage advanced technology. Technology has played a major role in logistics, and is expected to be even more critical for successful supply chains in the future. Employment of GPS systems, inventory management systems and other related IT solutions are expected to increase, thereby presenting logistics service providers with additional opportunities to assert themselves in the market. Effective implementation of technology-based solutions is likely to lead to increased productivity and operational efficiencies, which in the long run, would lead to cost reduction. Such an integrated service package would be suitable not just in attracting new customers, but also help in expanding the service offerings to existing customers in the region.

In the light of enhanced security requirements for the intra-Asia and trans-Pacific trade, the management of risk in the supply chain will sit squarely on the agenda of many LSPs. The cost of effective implementation of risk-based contingency programs will naturally lead to a re-visit of the operating procedures and processes of a shipper's supply chain. Conformance and compliance to global standards of risk mitigation will soon be a reality to ensure safe and uninterrupted passage from farm to table.

With a renewed focus on sustainability and environmental consciousness, the green movement will have its appeal among shippers and consumers in the supply chain. LSPs now need to consider carefully how to implement acceptable "green" logistics programs without unduly affecting their cost advantage and responsiveness of delivery. Slow steaming, emission control and other ecologically friendly initiatives may take precedence in this climate.

Final Words

This report represents a joint effort between The Logistics Institute – Asia Pacific and Frost & Sullivan to provide an updated scenario of the current and future state of logistics practices in the Asia-Pacific region. The key imperatives reflect an endless quest for a finish line that is not yet apparent in the horizon. With close links and partnerships with industry and government, The Logistics Institute – Asia Pacific aims at developing workable solutions to relevant logistics and supply chain management challenges, and endeavours to research the questions raised at the end of each section.

Note

The Institute works in close collaboration with industry consortia formed from members of the THINK Executive Forum. Members are welcome to join any of the THINK Executive organized programs, develop case studies, respond to industry surveys, and share in our focus groups and discussion events. For further information on how to become a member, please feel free to contact us at THINKExecutive@nus.edu.sg.

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About The Logistics Institute – Asia Pacific

Established in 1998 under the Global School House Program, The Logistics Institute – Asia Pacific (TLI – Asia Pacific) is a collaboration between the National University of Singapore (NUS) and the Georgia Institute of Technology (GT). Modelled after The Logistics Institute (now known as Supply Chain and Logistics Institute) at GT, the Institute's vision is to be the premier institute in Asia Pacific nurturing logistics excellence through research and education. TLI - Asia Pacific was awarded the prestigious Asian Freight & Supply Chain Award (AFSCA) for Best Education Course Provider for six consecutive years, from 2003 to 2008.

The Institute provides postgraduate and executive education in logistics and supply chain management (SCM), notably the Double Masters Degree in Logistics and SCM and the Executive Certificate in SCM. It also undertakes leading-edge research and development in supply chain engineering, technology and management in collaboration with industry; and hosts a regular series of THINK Tables that brings thought leaders in research and industry to discuss contemporary SCM issues, challenges and solutions in a dynamic environment.

The Institute's key research themes include Supply Chain Intelligence, Supply Chain Optimization and Supply Chain Technology.

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