

Drivers of Fifth Party Logistics (5pl) Service Providers for Supply Chain Management

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ABSTRACT

The process of the evolution trajectory of the management logistics function is tracked in the context of the theory and practice of a networked approach to supply chain management (SCM). Issues around the main competitive forces are driving reforms in deregulation, globalisation, and technological innovation resulting in fundamental changes in the way SCM is conceived and practiced. Emerging trends, such as the increasing need for strong interfirm networks, are identified as shaping the next generation of logistics management services. Important shifts are evident in purchasing and customer service functions, resulting in new management methods, business contexts, and transportation modes. Fundamental advances in SCM are largely attributable to the widespread adoption of electronic commerce in all business arenas, especially transportation and distribution. These developments have stimulated a focus on the service of logistics management as the basis of businesses cost competitiveness. Current issues and future trends are identified which are prompting firms to adopt Fourth Party Logistics (4PL) service outsourcing. Competitive pressures are leading to speculation about the future form of potential '5PL' services. Economic imperatives, technological innovation and managerial competence in the provision advanced logistics services are likely to succeed in environments capable of engendering high levels of commercial and social trust between the firms and their partner SCM service providers.

KEYWORDS

Supply chain management, logistics management, 3PL, 4PL, 5PL, interfirm networks, trust

INTRODUCTION

In the global and highly competitive environment of the 21st century, supply chain management (SCM) and logistics management are fundamental to firms seeking to improve their efficiency and effectiveness. Indeed, SCM is the cornerstone of competitive strategy, increased market share, and increasing shareholder value for many evolving firms (Coyle, Bardi & Langley 2003; Morgan & Monczka 2001; Hobbs 1996). Strategic thinking and organizational structuring within business has emerged to meet challenges from external influences stemming from new business contexts. A host of dynamic changes dependent on the global economy are driving customer expectations and demand that in turn have created opportunities to exploit the potential of emerging forms of logistics.

In the 1900s and 2000s, changes in logistics systems have been dramatic, including privatisation, deregulation, internationalisation, rationalisation, technology utilisation, and integration and consolidation (Transportation Industry Solutions 2004). Furthermore, other critical changes also include the rise of Third Party Logistics (3PL¹) and Fourth Party Logistics (4PL) service providers, more sophisticated partnerships, increasing intermodal movement of goods, decreasing logistics expense as a percent of GDP by improving firm productivity (Li, Liu, Lei, Zhao & Ren 2003). These changes are substantial and irreversible, making the forces driving them important issues for scrutiny by both academics and practitioners alike.

A remarkable rise in the international significance of services is evident in the 1900s and early 2000s which has been associated with a host of dynamic changes in the global economy, including customer expectations and demands, and opportunities offered by new technologies (Nankervis, Milton-Smith, Miyamoto & Taylor 2005). As a tertiary sector service, SCM firms are increasingly investigating ways of enhancing the efficiency and effectiveness of business processes. Further, these changes in the world economy are driving growth in customer expectations and demands to leverage the commercial opportunities offered by new technologies (Aggarwal 2003; Haynes & Thies 1992).

A network approach is a suitable theoretical approach for conceiving of the interrelated relationship between logistics providers, their customers and the suppliers (Hertz and Alfredsson 2003). A network approach permits firms activities to be understood by their direct and indirect relationships to other firms. Such relationships are traditionally between customers, suppliers, partners and the customers' of customer. It is worth bearing in mind that the primary independent variable for successful interfirm linkages is trust (Howarth, Gillin & Bailey 1995).

¹ 3PL firms provide outsourced or logistics services to companies for SCM functions. See later for details on 3PL, 4PL and 5PL service providers.

We begin with consolidated definitions of SCM, logistics management and outsourcing to inform the issues under consideration. This is followed by an overview of the changing context within which logistics management and SCM are embedded. A discussion is then undertaken of the main managerial and technological forces for changes that are contributing to the re conceptualisation of SCM practices. A synthesis is given of the diverse developments in logistics management and SCM. Events that have shaped current issues and future trends are identified that are increasingly prompting businesses to adopt the philosophy of SCM as 3PL, and emerging 4PL. Finally, implications for managers are explored, including speculation about the evolution to 5PL services.

SCM, LOGISTICS MANAGEMENT AND OUTSOURCING

Supply Chain Management (SCM)

Before embarking on a discussion of the historical context of the seminal issues that lie at the heart of the technological forces driving changes in SCM, it is useful to provide some considered definitions of the key terms involved to enable an informed conceptualisation of the semantics in the discipline. This provides a framework upon which to expand the ensuing debate. Logistics and SCM are frequently used interchangeably in the literature and in the lexicon of practice but need to be differentiated; “logistics is confined to movement of material, storage, and inventory management, whereas SCM has a larger scope covering issues related to purchase, partnerships, and customer satisfaction in addition to logistics related issues.” (Varma, Wadhwa & Deshmukh 2006: 224). More specifically, SCM may be defined as “a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements.” (Simchi-Levy, Kaminsky & Simchi-Levy 2003, p.1). Such a definition suggests that SCM is both a managerial and strategic function of businesses that is characterised by the pursuit in efficiency and effectiveness in networked systems. For more definitions and interpretations of SCM refer to Varma et al. (2006: 224-225).

Logistics management

A closely associated concept to SCM is logistics management. The Council of Supply Chain Management Professionals (CSCMP 2007) offers a broader definition of logistics management, compared to Varma et (2006), as being “that part of Supply Chain Management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers’ requirements.”. In essence, logistics management (i.e., the management of transportation and distribution) is an aspect of SCM, being less strategic in nature, focusing specifically on transportation and distribution.

Outsourcing

Both logistics management and SCM are heavily dependent on outsourcing which may be defined as “a strategic decision to contract out one or more activities required by the organization to a third-party specialist.” (Hong, Chin & Liu 2004, p.18). This definition highlights the ‘market’ oriented nature of outsourcing, which has led to 3PL specialist services. This involves the use of specialist logistics management service providers to orchestrate the firm’s transportation and distribution needs.

The previous section provided definitions of the most significant terms which inform the following discussion of the changing nature of the SCM context.

THE CHANGING CONTEXT OF LOGISTICS MANAGEMENT

SCM has been changing rapidly since the early 1990s. These contextual changes have been driven by changes in strategic management and business structure at the firm level, and from changes in the external business context within which business is embedded (Morgan & Monczka 2001). What is driving this contextual change?

Changes in strategic management

Prior to 1960, logistics was carried out as a series of fragmented, uncoordinated movements of goods and information. For example, order processing was often the responsibility of the accounting department; transportation was often the province of the marketing department; while the warehousing of

raw materials and in process goods was typically the domain of the manufacturing section. Such fragmentation provided a barrier for the efficient flow of goods into, through, and out of businesses, often resulting in lost productivity, wastage, and conflict within a company (Robeson & House 1985).

Traditionally, businesses have viewed logistics management as an internal managerial function, divisionalised within the firm's organizational structure (Waller, D'Avanzo & Lambert 1995). In more recent times, this view of logistics management has changed in response to emerging managerial philosophies and practices. Logistics management thinking and practices have evolved from a purely operational clerical function to a sophisticated approach that integrates complex strategies and technologies. Sometime ago, Williamson (1975, p.9) identified and articulated the reasons why some transactions occur in 'markets' that are external to firms, while others occur within the firms internal 'hierarchy'. Further, according to Williamson (1985), organizations seek to minimize the cost of the transaction, and hence, this then determines whether they use 'markets' or 'hierarchies'.

Later, Prahalad and Hamel (1990) proffered the notion of organizations maximising efficiencies by focusing on their 'core competencies'. Outsourcing is an offshoot of the 'core competencies' philosophy, and the evolution of more efficient external 'markets', relative to internal hierarchies. While logistics management has played, and continues to be a fundamental and a critical role in SCM, it is not simply the movement of people or goods to a geographic position. Indeed, logistics management may be regarded as the glue that binds the supply chains together. Contemporary logistics management now goes way beyond the movement of people or goods to a geographic location. In 'just-in-time environments' SCM has become indispensable (Germain, Droke, Spears 1996). For example, freight transportation is a vital element in the economies of nations and cities. The low cost and dependable movement of freight helps the competitiveness of businesses enterprises. In contrast, a major characteristic of less developed economies is poor transportation infrastructure.

Business growth and competitive pressures has forced the integration of logistics into a managerial function in its own right. This approach amalgamates two or more of the functions involving production flow as an interrelated system (Robeson & House 1985). For example, Milliken & Co., the largest textile producer in the US, was struggling with inefficiency, uncompetitive cost, and high inventory. In the textile industry short life cycles are common as are increasing demands for rapid response and just-in-time delivery (Clapp, Godfrey, Greeson, Johnson, Rich & Seastrunk 2007). In order to increase market share and quickly respond to customer needs, the company undertook a strategic integration of logistics functions by collaboration between retailers, apparel manufacturers, and textile producers. Using this approach the 'pipeline' was shortened within three years resulting in increasing sales by 31 percent, and inventory had been reduced by 30 percent (Christopher 1997).

Changes in business structure

With the dramatic growth in mass merchandising companies, such as Wal Mart, K Mart, and Target, and an emerging number of e-commerce retailers, such as Amazon.com, have precipitated a virtual revolution in distribution channels to fulfil particular consumer needs. Special services have been created by these companies, such as scheduled deliveries, special pallet packs, advanced shipment notices, and cross docking capabilities. This revolution has led to improved performance, lower prices, and greater flexibility. For instance, IKEA is the largest retailer of home furnishings in the world with over 100 stores, and revenues in excess of \$US5 billion. IKEA's logistics operation is the centrepiece of its global business system, with a network of 14 warehouses that link to point-of-sales data in all the stores. Warehouses operate as logistical control points, with consolidation centres, and transit hubs form a proactive part in the integration of supply and demand, which anticipates retail demand, and eliminates storage (Hertz & Alfredsson, 2003; Coyle et al. 2003).

Industry consolidation, by way of mergers and acquisitions, has accelerated the growth of enterprises at a global level. Distribution and transportation systems have now crossed national boundaries in support of global marketing initiatives. This was one of the most significant phenomena of the late 20th century. For example, retailers have been going global for some time, growing on average 40 percent faster than single country retailers (Information Systems and Logistics Distribution Conference 1998). Similarly, Circle International, a 3PL service provider, opened a 200,000 square foot distribution centre at its Asian headquarters in Singapore; and, DHL Worldwide Express and UPS Worldwide Logistics also opened new distribution facilities of 100,000 and 285,000 square feet respectively in order to cope with the requirements of consolidated global operations (Burnson 1999). Furthermore, consolidation of business

functions can also be found at regional levels. For instance, nearly 37 percent of all ocean cargo entering Europe passes through the port of Rotterdam, representing 5 million containers and 310 million tonnes of cargo annually (Foster 1999).

Changes in the international business context

Since the European Union became a borderless and powerful economic community, it has developed a high capacity infrastructure linking major European freight centres. The European Union has created a borderless rail freight system for longer distance distribution (Bookbinder & Tan 2003). Of all the changes that the single European market has witnessed, three affect SCM most directly (Cabdoi 2003):

- Facilitation of inter country shipment procedures, most notably through the use of a single administrative document (SAD) system to reduce border crossing time;
- Simplification of customs formalities for shipments simply 'passing through' countries en route to others; and,
- Introduction of common border posts, or banalisation.

According to The Global Competitiveness Report (2006-2007) Switzerland, Finland and Sweden are the world's most competitive economies. Denmark, Singapore, the US, Japan, Germany, the Netherlands and the UK are included in the top 10 list. The US shows the most marked decline, plunging from first to sixth. Similarly, in the past 25 years, several Pacific Rim countries have also emerged as key players in the global business environment. Singapore (5th) and Japan (7th) has achieved a dominant position in the region (The Global Competitiveness Report 2006-2007). Other Asian countries account for significant portions of global trade growth. Hong Kong, South Korea, Singapore, and Taiwan have achieved leadership positions in certain markets and product types.

China is now the third largest importing market in the world. China is also well on the way to achieving the status of a global manufacturing powerhouse by eclipsing Japan as the third largest trading economy in the world at the end of 2004. Epitomizing global supply chain theory, nearly 60 percent of China's imports and exports are generated by foreign companies engaged in export processing (The Global Competitiveness Report 2006). Today, Singapore leads international logistics with connections to 130 cities, in 56 countries and 740 ports worldwide (Xunhua 2004). India's 3PL services are still at a nascent stage but are nevertheless having a substantial impact on business performance. Considerable increases in outsourcing are proposed across all logistics functions in India in the next 2-5 years (Sahay & Mohan 2006).

Changes in transportation modes

The transportation industry has undergone enormous changes, particularly since the late 1970s. These changes have been reflected in prices, facilities, services, and managed operations. Indeed, the cost of transportation has been of major interest to business because it constitutes such a significant proportion of total production cost. For example, US transportation expenditures constitute a large segment of its economy:

Total transportation-related final demand rose by 33 percent between 1993 and 2003 ... from \$833.8 billion to \$1,112.8 billion. This measure—the value of transportation-related goods and services sold to the final users—European Union is a component of the Gross Domestic Product (GDP) and a broad measure of the importance of transportation to the economy. In 2003, the share of transportation related final demand in the GDP was 10.7 percent compared with 11.1 percent in 1993. The contribution of for-hire transportation industries to the U.S. economy, as measured by their value added (or net output), increased ... from \$217.2 billion in 1993 to \$314.3 billion in 2003. In the same time period, this segment's share in the GDP fluctuated slightly, remaining at around 3 percent (US Department of Transportation 2005).

More sophisticated preferences for transportation modes are an emerging phenomenon. Although the demand for freight transportation has increased considerably, freight expenditures have decreased as a percentage of GDP. This is largely attributable to less regulation, and the more efficient use of transportation modes (Coyle, Bardi, & Novack 2000). In terms of percent ton miles, railroads in the US have declined from 68 percent to 4 percent between 1939 and 1990 (ENO Foundation 1992). This decline has been absorbed by other transportation modes, including sea, air, and road. Also, a number of intermodal combinations have shown much growth in recent times. In the US, intermodal volumes grew

by 57 percent between 1990 and 2000. This trend has been driven by a number of factors, including higher import/export activity, improved intermodal compatibility, and lower costs (Bi-Annual Report 2003). The most common examples are trailer-on-flatcar (TOFC) or piggyback; container-on-flatcar (COFC); and roadtrailers (Stock & Lambert 2001). Effective communication and control systems have become essential in dealing with the complexities of intermodal transportation.

Door-to-door transportation

In all, the real cost of international freight movements has substantially declined. Air freight, in particular, has emerged as a more viable transportation alternative due to declining unit costs, excess capacity on some routes, efficiencies in the administration of international trade and the emergence of integrators capable of providing comprehensive door-to-door services OECD (2002). Global scale efficiencies have been achieved through expansion and integrated of the information networks for suppliers, dealers, partners, subsidiaries and alliances necessary for managing door-to-door deliveries. Advances in information technology have been possible through the integration of logistics operations across the supply chain. Increased competition among logistics providers has made door-to-door intermodal services a commercial reality. Various modal systems have been made possible by 3PL's capacity to serve as integrator to create seamless door-to-door operations (OECD 2002).

Business environment logistics systems were fundamentally altered in the late 1990s, in response to transformations in the landscape of logistics and SCM. Patterns of logistics systems have been radically restructured since the 1990s. This has resulted in changes to strategic thinking and organizational structuring within business, along with external influences, such as the business context and transportation modes. These developments all led to a focus on logistics management as a source of cost competitiveness, and a broadening of the logistics function of SCM. The major focus of SCM is on the networks necessary to physically move goods integral to firms' success. Distribution and transportation, like purchasing and customer service, are critical functions of SCM. All elements of the supply chain are involved—from the transportation of process inputs—to the distribution of the final product to the customer. Such networks have come to be dominated by service providers, as businesses outsource in the struggle to maintain and increase global competitiveness.

SCM AS AN OUTSOURCED SERVICE

The previous section traced the drivers in the transformation of logistics management to SCM since the 1960s. A number of factors were shown to have significantly increased the complexity of supply chains, and this necessarily raises the spectre of organizational capabilities and 'core competencies' (Prahalad & Hamel 1990). In this new business context, SCM can be construed as merely an auxiliary service that may be outsourced to another organization. A significant rise in the global significance of services was evident in the 1990s and 2000s (Nankervis, Milton-Smith, Miyamoto & Taylor 2005). Both the primary industry sector (agriculture and mining products), and the secondary industry sector (manufactured goods) in the global context have been transformed due to labour costs and developments in the production process. Tertiary sector service, of which SCM services is part, are also coming under increasing scrutiny as a means of enhancing the efficiency and effectiveness of business processes.

The effective management of this relationship between provider and customer involves a 'services paradigm' (Gummesson 1993), which attends to the nature of the services offered. The distinction between tertiary services and manufactured goods seems to lie in the roles of both the service providers and the service consumers. Such a distinction is important to the conceptualisation of a service, such as SCM. Zeithaml (2005) and Mudie and Cottam (1999) have identified four aspects that distinguish services from manufactured goods. These aspects are intangibility, inseparability, variability, and perishability. These aspects of services determine the fundamental difference between suppliers and consumers of goods. Thus, the strategic management of services requires managers to delineate the services provided through the development of measurable criteria, and those associated with service operations. This is particularly the case of seemingly intangible services like outsourced SCM.

The condition of intangibility is an obvious aspect of SCM services, which are provided in the absence of any material product. However, the characteristic of inseparability refers to the link between the production and the consumption of services. The service provider and the service customer are actively involved in the delivery process of a service, as the input and output of the service occur simultaneously. The condition of inseparability makes door-to-door delivery services commercially viable.

Services are inherently diverse and customised, and can be characterised by variability as a function of their delivery. Diversity in operation necessarily evokes the need for a complex strategic management planning process, in order to successfully deliver the services. In terms of outsourcing, this implies a strong need for effective information flows between the two parties, and an inherent sharing of sensitive information with the SCM service provider. Under these conditions, trust is a critical and enduring component for a successful partnership. This link is often reinforced by way of a gain sharing arrangement between customers and suppliers (Schwartz 2003). Finally, SCM services can be considered as perishable, as the service cannot be stored or reused, but rather can be considered as an experience, encounter, action, or event. In this situation, the strength of the bond between the customers and suppliers is again paramount.

Given the four characteristics of service, the development of service delivery assessment is an important function derived from an organization's perceptions. Several models have been developed to define and evaluate the quality of services (see, for example, Brady & Cronin 2001), which are inclusive of organization and service provider perspectives. These outcomes and processes of services differ from the traditional products of manufacturing and mining, through the unique nature of the relationship between the service provider and the organization. This relationship incorporates components of stakeholder relationship management, marketing, finance, and human resource management strategies. The service paradigm needs to ensure a balance between human input and technology, between cost and revenue, and between customer perceived quality and productivity (Gummesson 1993). SCM as a service to an organization requires a detailed knowledge of the goals and functions of the organization by the service provider, in order to maintain effective activities within the domain of the establishment.

In summary, SCM may properly be conceived as a tertiary service by its very nature is likely to be outsourced when a firm embraces a 'core competencies' view of its activities. As mentioned earlier, the main driving forces for change in business have been deregulation, globalisation, and technological innovation. In addition, there are other factors that have also impacted on business in recent years including empowered consumers, and a power shift in the supply chain (CSCMP 2007; OECD 2002). Characteristics of SCM require the strong and trusting link between the firm and its partner SCM service provider. All business areas of SCM, especially transportation and distribution, have been considerably impacted by the spread of information technology to manage logistics.

TECHNOLOGY AS A FORCE IN SCM

Issues surrounding the technological forces driving changes in logistics are the main focus of this treatise. SCM services are rapidly evolving due in large measure to the widespread adoption of electronic commerce (Cabdoi 2003). Besides a strategic approach to SCM leading to outsourcing, technological innovation and change has also been a driving force behind businesses outsourcing the SCM function (Hertz & Alfredsson 2003). Technological impetus for change in SCM is also the most significant driver to the outsourcing of SCM to the 4PL sector (Morgan & Monczka 2001).

In the sense of the SCM function, technology can be viewed as a facilitator of change. The revolution that has occurred in technological innovation (both hardware and software) has forced many companies to fundamentally change the way they do business. Technologies have become critical to firms, and certain new technologies are assisting to create competitive advantages (Li, Liu, Lei, Zhao & Ren 2003). Technological change in communications have improved operations, developed new business opportunities, and created closer customer relationships (Frost & Sullivan 2003). Significant price reductions in powerful computer equipment and the quality of the accompanying software has helped bring about enhanced inventory control, superior equipment scheduling that has resulted in dramatically more efficient transportation movements (Hertz & Alfredsson 2003; Li, Liu, Lei, Zhao & Ren 2003; OECD 2002).

In essence, technological innovation has resulted in a number of business context dynamics that have invariably impacted on SCM organizational strategies and structures. These dynamics include the expansion of marketing channels, the streamlining of operations, more efficient transportation modes, improved warehousing technology, and more powerful information technology. Each of these dynamics is considered in the next section.

Expansion of marketing channels

As a result of technological innovation, the real cost of information processing and communication have fallen dramatically from the 1900s onwards. This makes it possible for companies to more easily manage a global production system. A worldwide communication network has become essential for global businesses. e-commerce has become widespread in SCM. With the changes occurring from internet and other related technologies, products and services can be bought and sold anywhere in the world, no matter how large or small the enterprise. Product and service information is available on a real time basis and price and quality comparisons can quickly be made. The internet allows businesses, both small and large, to expand their global presence at a lower cost than ever before.

More efficient transportation modes

The transportation industry has also undergone considerable change over the past two decades. The use of technology to collect and convey information is not new to the transportation industry. Shippers' transportation requirements have been transformed by competition from fast, frequent and reliable services, just-in-time manufacturing, warehousing and distribution, door-to-door intermodal services, cargo tracing services and other advanced information related services (OECD 2002). Railroads use microwave technology to manage and track train movement, airlines use sophisticated avionics to manage the flight of their aircraft, ocean vessels use on- board computers to navigate domestic and international waterways, motor carriers use on- board computers and satellite systems to efficiently manage their asset base, and pipelines use computer technology to ensure the smooth flow of products. What is new is the integration of technology among carriers, shippers, receivers, and 3PL providers to efficiently and effectively manage the supply chain (Li, Liu, Lei, Zhao & Ren 2003; Coyle et al. 2000).

Improved Warehousing Technology

In warehouses, bar coding technology was introduced to improve order picking and fulfilment time. Scanning equipment at pick up, distribution terminals, and delivery allow customers to track and trace consignments in the system via the internet (Examples of Functionality 2004). Furthermore, Electronic Data Interchange (EDI) technology serves to interact with vendors and transportation partners in an effort to reduce order cycle time, and improve vendor order fill accuracy (Li, Liu, Lei, Zhao & Ren 2003; Sauvage 2003).

More Powerful Information Technology

The use of information technology has grown exponentially from the 1980s. This has subsequently had a massive impact on all business areas, especially transportation and distribution (Lewis & Talalayevsky 2000; Milligan 2000). The adoption of information technology is a major concern for logistics managers. The reasons for the exponential growth in the use of information technology are (Sangam 2006; Sohail & Al-Abdali 2005):

- Significant reduction in assets, such as inventories and equipment;
- More effective management of information, products, and cash flows among supply chain partners; and,
- Dramatic reduction in the cost of information technology over the last decade.

The number and types of technology that exist to facilitate logistics operations continue to grow at a rapid pace. However, certain technologies have become critical components to the logistics and SCM functions, including the following:

Internet

In the area of traffic management, companies use the web or the internet for communicating by email, tracking and tracing shipments, obtaining industry and carrier news and information, and conducting database searches. More than 50 percent of all transactions between carriers and their customers are estimated to be dealt with over the internet (Stock & Lambert 2001). It is fast becoming the primary interface mechanism for Business-to-Business (B2B) and Business-to-Customer (B2C) transactions because transportation companies can quickly offer broad service and market reach capabilities. The internet and related web services have become strategic weapons in determining success of SCMs (Transportation Industry Solutions 2004). Companies use internet sites to provide potential customers with product and price information. Many carriers have developed internet sites to allow customers to track their shipments. In addition, companies use internet based systems to share demand and production forecasts. Issues of capacity and security are challenges remaining with the use of the internet

for transportation and distribution transactions (Li, Liu, Lei, Zhao & Ren 2003).

Electronic Data Interchange (EDI)

EDI is probably one of the oldest technologies used in transportation and distribution. It can be defined as the application-to-application exchange of standard format business transactions. EDI replaces verbal and written communications with electronic ones. The benefits of EDI implementation are (Stock & Lambert 2001):

- Reduced paperwork;
- Improved accuracy due to a reduction in manual processing;
- Increased speed of transmission of the order and other data;
- Reduced clerical/administrative effort in data entry, filing, mailing, and related tasks;
- Increased opportunity for proactive contribution by employees because less time is spent on clerical tasks;
- Reduced costs of order placement, and related processing and handling;
- Improved information availability due to speed of acknowledgments and shipment advised;
- Reduced workload and improved accuracy of other departments through linking EDI with other systems, such as bar coding inventory and electronic funds transfers (EFTs); and,
- Reduced inventory due to improved accuracy and reduced order cycle time.

Although the use of EDI has its problems, including hardware/software compatibility, consistent formats, security, large investment, senior management support and ownership, it has become widely used to increase firm's competitive edge in logistics management and SCM.

Bar coding

The use of bar code technology started in the 1970s, and accelerated rapidly in the 1980s and 1990s. Bar coding at the warehouse improves data collection accuracy, reduces receiving operations time and data collection labour, and helps to integrate data collection with other areas, leading to better database and inventory controls (Li, Liu, Lei, Zhao & Ren 2003).

Track and trace

Radio frequency allows users to relay information via electromagnetic energy waves from a terminal to a base station linked in turn to a host computer that translate into on- board communications and computer capabilities. Terminals can be placed at a fixed location, installed on a forklift truck, or carried by hand to provide the dispatcher with continuous knowledge of the whereabouts of a vehicle, as well as the ability to determine the precise location of shipments. Through this same on- board capability, a driver has access to computerised capabilities, such as global positioning that provides real time knowledge of a goods current location and directions to the intended destination. When combined with a bar coding system for identifying inventory items, a radio frequency system can update inventory records in real time. By using in the warehouse or distribution centre, radio frequency results in significant improvement to the quality of order picking and shipping accuracy (Coyle et al. 2000).

Transportation software

Computerised transportation activities can be categorised into four groups (Haverly & Whelan 1996):

- *Transportation analysis*: Allows management to monitor costs and service by providing historical reporting of key performance indicators, such as carrier performance, shipping modes, traffic lane use, premium freight usage, and backhauls;
- *Traffic routing and scheduling*: Provides features such as the sequence and timing of vehicle stops, route determinations, shipping paperwork preparation, and vehicle availability;
- *Freight rate maintenance and auditing*: Maintains a database of freight rates used to rate shipments or to perform freight bill auditing; and,
- *Vehicle maintenance*: Features commonly provided by these packages include vehicle maintenance scheduling and reporting.

e-Flow

e-Flow is distributed by BasWare in Finland, and is used by over 1,000 companies in Europe to streamline their purchasing systems. The e-Flow system will replace the existing manual, paper based

systems used in the preparation, review, and approval of purchase orders, and the review and approval of invoices for payment. It replaces inefficient manual process with a system where all information is online (including the invoice image), and the distribution of this information is done instantaneously using electronic means. The key benefits of e-Flow are (Star Track Express 2003):

- Faster approval of purchases and invoices;
- Elimination of lost paperwork;
- More effective reporting; and
- Control of over purchasing.

e-Ports

e-Ports is an Australian designed and developed service that is 'showing the way' in the use of e-commerce techniques to improve container terminal productivity. It currently has over 2,100 individual users, accessing a range of online and download services tailored to the needs of three broad user categories; i.e., shipping lines, trucking companies, and general industry. Shipping lines use the service to compile load lists, track containers, and monitor receivers and deliveries. Trucking companies use e-Ports as the interface into the vehicle booking system at each of the company's container terminals, as well as the source of information on vessel movements, container tracking, and lodgement of online export receipt documentation.

e-Ports permit industry to have access to real time container tracking, as well as a range of reports tailored to the requirements of particular types of businesses (Showing the Way 2004). The level of technology use will vary between and within firms. Despite such variation, it is clear that the use of technology is expanding at a rapid pace in the area of transportation and distribution, and it will continue to grow well into the future (Sahay & Mohan 2006; Bureau of Transportation Statistics 2005, Cabdoi 2003, Frost & Sullivan 2003).

The preceding discussion highlighted the complexity invoked, and the SCM function by technological innovation, and this is necessitating the growing necessity for specialist expertise to deal with the complexity. In the next section we define and describe the notion of 3PLs, the evolving 4PLs, and speculate on the emergence of the possible form of 5PLs.

3PL, 4PL AND 5PL LOGISTICS PROVIDERS

3PL (third party logistics providers)

3PL firms provide outsourced or logistics services to companies for an aspect, or sometimes all of their SCM functions. 3PL logistics providers typically specialize in integrated warehousing and transportation. These services are capable of being systematically scaled and customized to clients needs in response to market conditions which determine the demands and delivery service requirements for products and materials (Sangam 2006). Four categories of 3PL providers are identified by Hertz and Alfredsson (2003):

Standard 3PL providers are the most basic form of a 3PL provider. Activities performed include the most basic functions of logistics—'picking and packing', warehousing, and distribution. 3PL functions are not the main activity of these firms.

Service developers are a type of 3PL provider which offers customers advanced value added services in the form of: 'tracking and tracing', cross-docking, specific packaging, or a unique security system. A strong information technology platform, combined with a focus on economies of scale and scope, enable this type of 3PL provider to undertake these tasks.

Customer adapters are a form of 3PL provider which responds to requests from a customer to take complete control of the company's logistics activities. New logistics services are not provided or dramatically improved. The customer base is typically quite small.

Customer developers are the highest level 3PL provision with respect to its processes and activities. A 3PL provider integrates its activities with the customer and controls the entire logistics function. Extensive and detailed tasks are performed for few providers.

4PL (fourth party logistics providers)

Accenture™ first coined and registered the term 4PL as a trademark in 1996 (Li, Liu, Lei, Zhao & Ren 2003: 838). 4PL providers (sometimes called Lead Logistics Providers) may be defined as "A supply

chain integrator that assembles and manages the resources, capabilities, and technology of its own organization with those of complementary service providers to deliver a comprehensive supply chain solution." (Accenture cited in Cabdoi 2003). 4PLs may be considered a refinement and extension of the 3PL concept. One differentiator of 4PL lies in the capacity to "create unique and comprehensive supply chain solutions that cannot be supplied by any single provider." (Li, Liu, Lei, Zhao & Ren 2003, p.839). Essentially, a 4PL is an "integrator that assembles the resources, capabilities, and technology of its own organization and other organizations to design, build and run comprehensive supply chain solutions." (Li, Liu, Lei, Zhao & Ren 2003, p.838).

A 4PL firm employs 3PL providers to supply services to customers through proprietary computer systems and intellectual capital. A 4PL firm provides outsourced or 'third party' logistics services to companies aspects of, or sometimes all, of their SCM functions. A great deal of emphasis is placed on the 4PL provider being a single point of contact for the shipper as an integrated part of the business solution to the client. A fundamental feature of a 4PL provider, which is considered a 'non asset', is in principle of being 'neutral' in selecting shipping partners. The goal of 4PL is to achieve benefits beyond the one time operating cost by reducing asset transfers gained from a traditional outsourcing relationship.

By adopting a holistic approach, 4PL has emerged as a breakthrough supply chain solution by comprehensively integrating the competencies of 3PL providers, leading edge consulting firms and technology providers. Such strategic alliances leverage the skill sets, strategies, technology and global reach, which would have otherwise take years to duplicate. 4PL markets are expected to generate substantial revenue growth from approximately €4.7 billion in 2002 to about €13 billion by 2010 in Western Europe in the chemicals, electronics/high tech and automotive sectors (Frost & Sullivan 2003). Cabodi (2003) noted that "4PL, supply chain outsourcing has undergone a paradigm shift from a cost centre to a revenue generating opportunity. It has leveraged logistics to improve the service level to customers, accelerate the speed of launching new products and stimulate market penetration." (Frost & Sullivan 2003). Accordingly, 4PL's main competency lies in sustaining long term investment and ongoing benefits once initial cost savings are achieved.

As a result of the growth of outsourcing and 3PL services, the complexity of SCM has grown in parallel, to such an extent that it is often a task falling outside the boundaries of company expertise and 'core competencies'. For example, 60 percent of US companies using 3PL services report using multiple 3PL providers (Richardson & Vitasek 2005). At one stage, Lucent Technology had 1,700 3PL providers (Schwartz 2003). Rises in complexity of SCM has led to the evolution of 4PL service providers, who handle the function of managing the complex network of 3PL providers. Beiderman (2005, p.1) suggests that 4PL can be interpreted as "the practice of consulting firms, as non asset based managers, in overseeing the work of multiple 3PL providers in managing global supply chains". Manchester (2001, p.4) preferred to describe 4PL as "outsourced outsourcing" while Schwartz (2003, p.54) has suggested that 4PL is actually "extreme outsourcing".

5PL (fifth party logistics providers)

Trends to outsourcing SCM to 4PL service providers are likely to continue to drive more effective and efficient business practices in the 21st century. A number of issues will likely impact on the increasing spread of this phenomenon. Distribution and transportation, like purchasing and customer service, are critical functions of SCM that have greatly impacted on economic systems in recent years. There continues to be considerable changes occurring in SCM, including the evolution of 3PL and 4PL services. The main forces driving these changes are deregulation, globalisation, and technological innovation. The evolution of 3PL and 4PL, and the proposed 5PL, has the potential to positively impact on firms by way of reduced logistics costs, lower levels of inventory, and increased response to customer demands.

With the more aggressive competitive global environment (Hill 2003), SCM portrays a great deal of potential to provide a competitive edge and tailor made customer service (Milligan 2000). A number of current issues, including security, environment and energy are critical, and will increasingly impact on the cost and performance of logistics systems. The result of security, environment, and energy concerns, as well as on going technological innovation, means that SCM is becoming increasingly complex, and hence, far more challenging for managers. Increasing populations and economic growth has increased the demand for energy and transportation, with resulting environmental consequences.

IMPLICATIONS FOR MANAGERS

A number of factors have been identified as contributing to the trend in outsourcing SCM to 4PL service providers. As Sohail (2006, p.80) observed – “Building a successful logistics outsourcing relationships is embedded in the service providers’ technological ability to improve value added services.” These factors, including the continued search for an elusive competitive edge, technological innovation, and security, environment, and energy concerns, is radically altering the complexity of the SCM function. This has been the case as much for ‘Western’ business as it has for those operating in the ‘Eastern’ context (Jiang & Prater 2003). For example, Hong et al. (2004) noted the increasing trend for Chinese firms to outsource logistics services. Indeed, globalisation will foster the demand for 4PL services, since it involves reducing trade barriers and import tariffs (Fourth-Party Logistics 2004).

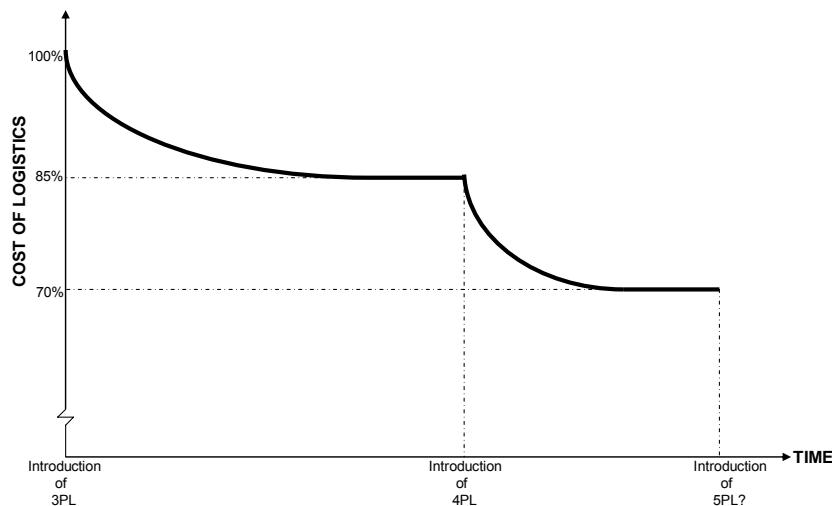
Consequently, managers dealing with SCM functions within firms will have to develop heightened collaborative skills in their interactions with 3PL and 4PL interfirm network partners (Craig 2005; Egan 2005). Indeed, interfirm networks have become increasingly common in the business world in general. The proliferation of interfirm networks can be attributed to an increasingly competitive and resource demanding global business environment, which is forcing firms to cooperate in order to compete (Rugman & Verbeke; 2003; Smith, Carroll & Ashford 1995; Bleek & Ernst 1993; Ohmae 1989). Despite the proliferation of interfirm network partners, however, interfirm networks are problematic. Studies suggest that perhaps 30-70 percent of interfirm linkages perform unsatisfactorily (Butterly & Butterly 1994). This is a rather disturbing statistic for those firms considering outsourcing the SCM function, because of the close strategic link between the organization and the 4PL service provider, and the necessity to share sensitive information.

Managers also need to be aware of the risks of outsourcing 4PL services, including (Richardson & Vitasek 2005; Burt, Dobler, & Starling 2003; Elliff 2004; Leenders, Fearon, Flynn & Johnson 2002):

- Loss of control: Sensitive information must be shared;
- Lack of performance measurement: What should be measured, how it should be measured, and what incentives should be put in place;
- Lack of internal expertise: The 4PL relationship must be effectively managed; managers often do not fully comprehend the nature of the interfirm linkage; and,
- Lock-in or dependency: Difficult to change partners should the interfirm linkage prove unsuccessful.

There is a tendency of 4PL service providers to be borne out of 3PL providers. For example, FedEx, UPS, TNT, and DHL are all players in both 3PL and 4PL (Express Transport Companies’ Shift to 4PL 2006). Despite 4PL service providers being portrayed as ostensibly “neutral” (Craig 2003, p.2), it does raise a serious conflict of interest dilemma, in that a 4PL service provider will most likely form partnerships with its 3PL divisions. Overall, the system may be more effectively managed than the in-sourced option, but may not necessarily be optimised. These risks highlight the need for managers intending to outsource SCM to have sufficient trust in the service provider to accept the sharing of sensitive information must effectively manage cross corporation and cross cultural relationship; and have an exit strategy if the partnership does not prove successful. The implications of the changing dynamic in SCM is that there will be an increasing need for strong interfirm networks connecting firms with their 4PL service providers.

Celestino (1999) reported that firms may save between 15 percent and 25 percent in the cost of logistics by outsourcing to 3PL service providers, depending on industry and country. Moreover, cost reductions in the US tend to be more than the global average (Hickey 2004). Likewise, the ‘chemical products’ industry tends to make more use of 3PL than the ‘machinery’ industry (Hong et al. 2004). Outsourcing to 4PL service providers also offers similar cost reductions, but the exponential decay over time is more pronounced, with most savings coming in the first two years of implementation (Richardson & Vitasek 2005). Figure 1 graphically displays the cost reductions evident with the sequential introduction of 3PL and 4PL philosophies.

Figure 1: Cost of logistics over time

In the constant search for global competitiveness, Figure 1 begs the question of what lies ahead, as 4PL cost reductions run their natural course. Clearly, the necessary technology is available to deliver more advanced logistics systems. The question is—will the cost involved in deploying such a solution be justified given that the gains in productivity for 5PL systems are unlikely to be of the order of magnitude achieved by 3PL and 4PL systems? While productivity gains are likely to be somewhat less, they may well be enough to ensure a competitive edge is maintained. Incremental gains in cost reductions and efficiencies may be enough to justify the investment in such systems.

As such, the next significant strategic initiative in SCM may be (what we shall term within the current context) the ‘5PL’ service provision. This would entail the ‘transaction cost analysis’ (Heide & John 1988, p.20) approach applied to 4PL systems, requiring extensive evaluation and analysis of the performance of 3PL and 4PL service providers, and consequential optimisation of the entire system. There is a need to circumvent the often incestuous relationships that has become apparent in the 3PL and 4PL systems, as well as alleviate the lack of ‘comparative’ financial examination and performance metric evaluation currently evident (i.e., ‘compared’ to possible alternatives that a 5PL service provider could deliver).

Several of the factors that have determined the uptake and success of 3 PL and 4PL are also likely drive the adoption of 5PL. Frost and Sullivan (2003) identified the need for an even greater the emphasis to be given how to customers whose requirements will become far more demanding. Shippers’ who enter a logistics outsourcing project want a single point contact with one company and supply chain visibility. Customers will increasingly demand more strategic, solution driven, global results.

Many of the issues identified with the implementation of 4PL may well continue to mitigate against the successful development and adoption by firms of potential 5PL services (Cabdoi 2003). One of the problems with introducing PPL services has been the adoption of sophisticated and complex services without regard to established business strategies (Hertz & Alfredsson 2003). According to Hertz and Alfredsson (2003) a recurring problem with the move to 4PL business is the need to maintain a ‘neutral’ position compared to traditional business modes of operation. Another issue associated the internationalisation of 5PL service is the need to develop different patterns and networks. Coping with strategic alliances, mergers and acquisitions is also seen as being vital for the understanding and developing business alliances between firms and %PL providers. These business issues are likely to impact on any extension of 4PL into the future notion of 5PL.

Trust matters

Cost considerations are just one aspect of the control mechanism in interfirm relationships. An increasing dissatisfaction with the scope 3PL and 4PL services, coupled with the greater complexity of supply chains, are likely to increase the demand for 5PL ‘metaproviders’ who are capable of being a trusted partner and taking on a substantial strategic role by sharing the associated commercial risk and rewards. This increases the need to build and maintain trust between the mutually dependent parties. Trust is initially established by clear and unambiguous expectation and reinforced by delivery of the promised

value proposition and facilitates familiarity, and leads to commitment in the relationship (Rodriguez & Wilson 2002; Kramer 1999; Lorenzoni & Lipparini 1999; Madhok 1995). This is a truism for any form of interfirm linkage, including 4PL and proposed 5PL services (Knemeyer & Murphy 2004; Schwartz 2003).

As business relationships between the parties become more entwined informal and formal relationships between client and provider will become closer and more interdependent. Hertz and Alfredsson (2003) observed, trust between the parties is crucial for relations requiring economic, physical, technological, knowledge, and social exchange. Relationships of this nature tend to be for the long haul and serve to motivate the ongoing process of integrating business functions and processes. Economic imperatives, technological excellence and managerial competence in logistics provision are only likely to succeed in environments with high levels of commercial and personal trust between the parties (Schwartz 2003).

Issues around the business arrangements and performance expectations, identified by Frost and Sullivan (2003), for 4PL service providers will need to be solved by 5PL aspirants. As with 4PLs, 5PLs will need to have a high degree of adaptability in meeting customers' needs. The quality of the relationship between the 5PL service suppliers and their clients will determine how effectively the two parties are able to combine to aggregate available 'inside' and 'outside' resources (Li, Liu, Lei, Zhao and Ren 2003, p. 838). Customers will have to be convinced there is tangible added value flowing will be provided by new types of working arrangements as the perceived and actual cost may be higher than for providing existing 3PL or 4PL services. Much will depend on the scope of the working arrangement and SCM capabilities of suppliers and shippers. More focus and energy will need to be expended on working with clients to realise transformative efficiencies from redesigning and reengineering the supply chain through to changing the client's overall business processes and internal dynamics of organizations.

Long term strategic partnership will be required to ensure major internal transformations do not constitute an unacceptable exposure for both the supplier and the customer. Competitive pressures will continue the push to enhance the use of the contract logistics services through the use of outsourcing. In an industry characterised by time based competition, technological effort will continue to be the main differentiation between the various logistics providers (Sauvage 2003). Optimized web and internet based technology will continue to provide considerable opportunities for businesses to leverage multiple supply chain processes and effectiveness (Li, Liu, Lei, Zhao and Ren 2003).

Greater competitiveness in transport industry has created higher quality value added services, further supply chain integration, and strategic partnerships. Alliances, mergers and acquisitions between 5PL provider and between customers are set to continue apace (Hertz and Alfredsson 2003). When combined with continued global competition among firms this will force the speed and intensity of innovation and exert downward pressures on costs leading to further efficiencies (OECD 2002). Thus, a congruence of goals and effective communication between the both the supplier and customer are critical to generating real value in such partnerships. A continuing challenge for prospective 5PL providers will be balancing the capacity to be flexible to individual customers with the systems to coordinate and serve the needs of multiple customers (Hertz & Alfredsson 2003).

CONCLUSION

Dynamic developments in logistic management thinking and practice were addressed in this critique. This required a synthesis to be made of the diverse and historical issues that have shaped the development of logistics management in the context of SCM. In hyper competitive commercial environments, SCM is dependent on creating new ways of doing business. Innovative business approaches are needed to meet the challenge of these new competitive environments. Indeed, the diffusion of innovation within, and between, companies will be essential in redefining SCM. As with the initial resistance to the acceptance, adoption and implementation of the 5PL value proposition these issues go beyond technological or pure economic concerns. Any notion of 5PL will depend on providing a service capacity to develop and implement a networked, flexible supply chain capable of seamlessly integrating and meeting the demands of all partners, including manufacturers, suppliers, carriers, and vendors. Such productivity gains will probably result from breakout technologies capable of fully integrating and mobilising all the business aspects of SCM. One critical aspect of the soft skills required is the capacity to develop and maintain a sense of trust on commercial, operational and personal level. Thus, it would appear that future 5PL service providers will need to demonstrably gain and maintain a holistic and fully integrated SCM to achieve a competitive advantage for their clients.

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