Determinants of Fifth Party Logistics (5PL): service providers for Supply Chain Management

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Abstract: The theory and practice of a networked approach to Supply Chain Management (SCM) are used to trace the evolution of management logistics. Reforming influences on competitive forces have deregulated, globalised and innovated, changing fundamentally the conception and practice of SCM. Increased need for strong interfirm networks, among other trends, seems formative. Changed purchasing and customer service functions result in new management methods, business contexts and transportation modes. Radical advances in managing supply chains stem from electronic commerce, notably in transportation and distribution, now widely adopted. Hence, managing logistics services becomes basic to businesses' competitiveness. Economic imperatives, technological innovations, market competition and managerial ability to provide

advanced logistics services is encouraging increased trust between firms and their SCM providers. Issues and future trends are prompting the outsourcing of Fourth Party Logistics (4PL) services are identified. Possible future '5PL' services are meta-analytically indicated, with future empirical research suggestions based on novel insights.

Keywords: SCM; supply chain management; 3PL; 4PL; 5PL; interfirm networks; trust; empirical research.

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1 Introduction

In the global and highly competitive environment of the 21st century, Supply Chain Management (SCM) and logistics management are fundamental to firms striving to improve their efficiency and effectiveness to gain a competitive edge. Indeed, SCM is the cornerstone of competitive strategy, increased market share and increasing shareholder value for many evolving firms (Coyle et al., 2003; Hobbs, 1996; Morgan and Monczka, 2001). Strategic thinking and organizational structuring within business have emerged to meet challenges from the external influence of business in new contexts. A host of dynamic changes dependent on the global economy are driving customer expectations and demand, which in turn have created opportunities to exploit the potential of emerging forms of logistics.

The concept of SCM has undergone considerable change in the process of informing macro level understanding in micro level classification decisions. Before the Second World War, Coase (1937) introduced the macro level SCM organisational mechanism. Later, transactional economics based on the work of Williamson (1975) addressed inter-organisational relationships related to SCM. Ven et al. (1975) led theorists to identify the concepts of networks, as opposed to linear supply chains (Lamming, 1996). The term SCM was introduced into the literature by Oliver and Webber (1982). They considered SCM to be a management concept in which the marketing channel should be seen as a single integrated entity.

Many experts have since provided a variety of different definitions and descriptions of SCM. Before embarking on a discussion of the historical context of the seminal issues which lie at the heart of the technological forces driving changes in SCM, it may be useful to provide some considered definitions of the seminal terms to allow an informed conceptualisation of the semantics in the discipline. This provides a framework within which to expand the ensuing debate.

Initially, Jones and Riley (1985) considered SCM as fully covering the flow of materials all the way from the suppliers to the end users. Ellram and Cooper (1990) considered SCM as an integrating philosophy to manage the total flow of a distribution channel from the supplier to the ultimate customer. Scott and Westbrook (1991, p.25) defined SCM as "the supply chain… used to refer to the chain linking each element of the production and supply processes from raw materials through [to] the end customer." According to Lee and Bellington (1992), SCM is a network of manufacturing and distribution sites which procure raw materials, transform them into intermediate and finished products and ultimately distribute the finished products to customers. Finally, Simchi-Levy et al. (2003, p.1) defined SCM as "a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses and stores, so that merchandise is produced and distributed [in] the right quantities, to the right locations and at the right time, in order to minimize system wide costs while satisfying service level requirements." Such a definition suggests that SCM is both a managerial and strategic function of businesses, which is characterised by the pursuit of efficiency and effectiveness in networked systems.

Logistics and SCM, though frequently used interchangeably in the literature and in the lexicon of practice, should be differentiated. Varma et al. in 2006 (p.224) provided the most comprehensive and contemporary approach to distinguish between SCM and logistics: "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."

Any supply chain must control the inbound, outbound and reverse logistics functions, with a supporting information system. These activities, nodes and linkages of international value chain have spread widely throughout the world and therefore it is essential to carefully coordinate these operations. For more definitions and interpretations of SCM, refer to Varma et al. (2006).

1.1 Logistics management

Logistics management is a concept closely associated with SCM. The Council of SCM Professionals (CSCMP, 2007) offers a broader definition of logistics management than that of Varma et al. (2006, pp.224–225), as being "that part of SCM 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 is an aspect of SCM, but less strategic in nature, focusing specifically on transportation and distribution (williams, 1994).

1.2 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 organisation to a third-party specialist" (Hong et al., 2004). This definition highlights the 'market' oriented nature of outsourcing, which has led to 3PL specialist services. Service providers who specialise in logistics management are employed to orchestrate the firm's transportation and distribution needs. In the preceding section, definitions were provided of the terms which inform the following discussion of the changing nature of the SCM context. The section as a whole considers the evolving context of logistics management.

2 Historical evolution

From the late 1990s and early 2000s onwards, changes in logistics systems were dramatic; they included privatisation, deregulation, internationalisation, rationalisation, the use of technology, integration and consolidation (Transportation Industry Solutions, 2004). Other critical changes evident during this period also include the rise of Third Party Logistics (3PL) and Fourth Party Logistics (4PL) service providers, more sophisticated partnerships and the increasing intermodal movement of goods. This improved firm productivity as a percentage of GDP by reducing the spending on logistics (Li et al., 2003). These changes are substantial and irreversible, making the forces driving them important areas for scrutiny by both academics and practitioners.

A remarkable rise in the international significance of services is also evident in the late 1900s and early 2000s has been associated with a host of dynamic changes in global economies, including customer expectations and demands and the opportunities offered by new technologies investigating more and more ways of enhancing the efficiency and effectiveness of business processes. 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 and Thies, 1992).

A network approach is a suitable theoretical approach for conceiving the interrelated relationship between Logistics Service Providers (LSPs), their customers and the suppliers

(Hertz and Alfredsson, 2003). A network *modus operandi* permits firms' activities to be understood through their direct and indirect relationships to other firms. Such relationships are traditionally between customers, suppliers, partners and the customers of customers. A critical component of successful interfirm linkages is *trust* (Howarth, Gillin and Bailey, 1995).

Issues under consideration here are informed by a synthesis of the theory informing logistics management and outsourcing. This begins with an overview of the changing context embedded in logistics management and SCM. There follows a discussion of the main managerial and technological forces for change which are contributing to the reconceptualisation of SCM practices, leading to a synthesis of the diverse developments in logistics management and SCM. Some events shaping current issues are identified, as are some future trends which are increasingly prompting businesses to adopt the philosophy of SCM as 3PL and emerging 4PL. Finally, the implications for managers are explored, including speculation about the evolution to 5PL services.

3 Present scenario of logistics outsourcing: review of 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 and Monczka, 2001). This has created a need to identify the business drivers causing this contextual change.

3.1 Changes in strategic management

Before the 1960s, logistics functions were undertaken 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 a 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 and House, 1985).

Traditionally, businesses have viewed logistics management as an internal managerial function, divisionalised within the firm's organisational structure (Waller et al., 1995). Eventually, however, this view of logistics management 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 which integrates complex strategies and technologies. Williamson (1975, p.9) identified and articulated the reasons why some transactions occur in 'markets' which are external to firms, while others occur within the firm's internal 'hierarchy.' Further, according to Williamson (1985), organisations seek to minimize the cost of any transaction and this determines whether they use strategies based on 'markets' or 'hierarchies.'

Later et al., (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 external markets as more efficient than internal hierarchies.

While logistics management has played and continues to take a fundamental and critical role in SCM, it does not simply refer to the movement of people or goods to a geographic place. Indeed, logistics management may be regarded as the glue which binds the supply chains together. Contemporary logistics management now goes far beyond the movement of people or goods to a geographic location. In 'just-in-time environments', SCM has become indispensable (Germain et al., 1996) making freight transportation a vital element in the economies of nations and cities. The low cost and dependable movement of freight helps businesses enterprises to be competitive. In contrast, a major characteristic of less developed economies is poor transportation infrastructure.

Business growth and competitive pressures have forced the integration of logistics per se into the managerial function. This approach amalgamates two or more of the functions involving production flow as an interrelated system (Robeson and 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 et al., 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. With this approach, the 'pipeline' was shortened within three years, resulting in increasing sales by 31% and inventory reduction of 30% (Christopher, 1997).

3.2 Changes in the business structure

The dramatic growth in mass merchandising companies, such as Walmart, Kmart and Target and an emerging number of e-commerce retailers, such as Amazon.com, have precipitated a virtual revolution in distribution channels to fulfill 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 (Cooper et al., 1997). 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 centre piece of its global business system, with a network of 14 warehouses linked to point-of-sales data in all stores. In this system, warehouses operate as logistical control points, with consolidation centre's and transit hubs forming a proactive part in the integration of supply and demand; this anticipates retail demand and eliminates storage (Coyle et al., 2003; Hertz and Alfredsson, 2003).

Distribution and transportation systems now cross national boundaries in support of global marketing initiatives. Industry consolidation, by way of mergers and acquisitions, has accelerated the growth of enterprises at a global level (Eno Foundation, 1992). 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% 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; while 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% of all ocean cargo entering Europe passes through the port of Rotterdam, representing 5 million containers and 310 million tones of cargo annually (Foster, 1999).

3.3 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 centre's. A borderless rail freight system to enable longer distance distribution has emerged (Bookbinder and Tan, 2003). Of all the changes that the single European market has witnessed, four directly affect SCM:

1 liberalisation of transport between EU member countries

2 facilitation of inter country shipment procedures in trade with third countries, most notably through the use of a Single Administrative Document (SAD) to reduce border crossing time

3 simplification of customs formalities for transit shipments (TIR procedures)

4 promotion of green logistics by wider inclusion of rail and water transport, development of intermodal technologies, unification of technical standards and simplification of administrative procedures.

According to The Global Competitiveness Report 2010–2011 (World Economic Forum, 2010), Switzerland and Sweden are the world's most competitive economies. Singapore, the US, Germany, Japan, Finland, the Netherlands, Denmark and Canada are included in the top 10. The US shows the most marked decline, plunging from first in The Global Competitiveness Report 2006–2007 (World Economic Forum, 2006) to fourth in the last one. Similarly, in the past 25 years, several Pacific Rim countries have also emerged as key players in the global business environment. Singapore (3rd) and Japan (6th) have achieved a dominant position in the region. Other Asian countries account for significant portions of global trade growth. China is one of the top exporters and importers. Hong Kong, Taiwan, South Korea and Singapore have also taken leadership positions in certain markets and types of product (US Department of Transportation, 2006).

China is the leading exporter at present and the second largest importing market in the world. China has achieved the status of a global manufacturing powerhouse, eclipsing Japan at the end of 2004 as the third largest trading economy in the world. Epitomizing the global supply chain, the greater part of China's imports and exports are generated by foreign companies engaged in export. 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 from around 2010 (Sahay and Mohan, 2006).

3.4 Changes in transportation modes

The transportation industry has undergone enormous changes, since the late 1970s in particular. 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, the US

transportation expenditure constitutes a large segment of its economy. The contribution of for-hire transportation industries to the US economy, as measured by their GDP input, increased from $172.8 billion in 1990 to $418.7 billion in 2008. The share in the GDP fluctuated slightly, remaining at around 3% (Bureau of Transportation Statistics, 2011).

In the Europe Gross Value Added (GVA) is a broad measure of the importance of transportation to the economy. With around €520 billion in GVA at basic prices, the provision of transport services (including storage, warehousing and other auxiliary activities) accounted for about 4.6 % of total GVA in the EU-27 in 2008 (European Commission, 2011).

Over several decades, the road and sea transport of goods in the EU increased strongly, while rail and inland waterways declined. The modal split has changed considerably. After 1996 the use of road freight transport increased steadily and strongly and by 2006 its share (in terms of tonne-kilometres) of total freight (excluding air transport and extra-EU-27 sea transport) was approaching 50% (European Commission and Eurostat, 2009). The changes were mainly caused by the changing structure of industry and changes in the type of goods produced in the various sectors. Mass commodities, more suitable for rail and inland waterway transport, have broadly become less important to the economy. The US has a more balanced modal share, with rail taking the highest share (43%), followed by road (30%) and pipelines (14%), inland navigation (8%) and short-sea shipping (5%) (European Commission, 2010).

Moreover, a number of intermodal combinations have shown much growth in recent times. In the US, intermodal volumes grew by 57% between 1990 and 2000. This trend was 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 road trailers (Stock and Lambert, 2001). Effective communication and control systems have become essential in dealing with the complexities of intermodal transportation (Langley, 2008–2012).

More sophisticated preferences for transportation modes are an emerging trend. Although the demand for freight transportation has increased considerably, freight expenditures have declined as a percentage of GDP. This is largely attributable to less regulation and the more efficient use of transportation modes (Coyle et al., 2000).

3.5 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 option, 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 with the information networks for suppliers, dealers, partners, subsidiaries and alliances necessary for managing door-to-door deliveries. Advances in Information Technology (IT) have been possible through the integration of logistics operations across the supply chain. Increased competition between 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 creating seamless door-to-door operations (OECD, 2002).

Patterns of logistics systems have been radically restructured since the 1990s. This has resulted in changes to strategic thinking and organisational 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 which are 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. Business environment logistics systems were fundamentally altered after the late 1990s, in response to transformations in the landscape of logistics and SCM.

4 Three main drivers of 5PL evolution

4.1 Driver 1: increased trend of SCM as an outsourced service

The previous section traced the drivers in the transformation of logistics management into SCM after the 1960s. A number of factors were shown to have significantly increased the complexity of supply chains and this necessarily raises the specter of organisational capabilities and core competencies (Prahalad and Hamel, 1990). In this new business context, SCM can be construed as merely an auxiliary service which may be outsourced to another organisation (Ansari and Modarress, 2010).

A significant rise in the global significance of services was evident in the 1990s and 2000s (Nankervis et al., 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 (Langley 2010; 2012). The distinction between tertiary services and manufactured goods seems to lie in the roles of both the service providers and the service consumers (Shi and Arthanari, 2011). Such a distinction is important to the conceptualisation of a service such as SCM. Zeithaml (2005) and also Mudie and Cottam (1999) have identified four aspects distinguishing 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 (Batti et al., 2010).

Tertiary sector services such as SCM services 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 accommodates the nature of the services offered. 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 with seemingly intangible services such as outsourced SCM (Langley, 2010; 2012).

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 (Hosie, 2008). 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 an intense need for effective information flows between the two parties and an inherent sharing of sensitive information with the SCM service provider. In 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 perishable, since the service cannot be stored or reused, but rather seen 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 characteristics of service, the development of service delivery assessment is an important function derived from an organisation's perceptions. Several models have been developed to define and evaluate the quality of services (see, for example, Brady and Cronin, 2001), which include the perspectives of both the organisation and service provider. 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 organisation. 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 organisation requires the service provider to know in detail the goals and functions of the organisation, in order to maintain effective activities within the domain of the establishment.

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

4.2 Driver 2: technology as a force in SCM

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

In essence, technological innovation has resulted in a number of business context dynamics which have invariably impacted on SCM organisational 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 IT. Issues surrounding the technological forces behind changes in logistics are rapidly evolving, due largely to the widespread adoption of electronic commerce (Cabdoi, 2003). As well as the move to outsourcing prompted by the strategic approach to SCM, technological innovation and change have also been a driving force behind businesses outsourcing the SCM function (Hertz and Alfredsson, 2003). His technological impetus for change in SCM is also the most significant inducement to outsource SCM in the 4PL sector (Morgan and Monczka, 2001). Each of these dynamics is considered in the next section.

4.2.1 Expansion of marketing channels

As a result of technological innovation, the real costs of information processing and communication have fallen dramatically since the 1900s. 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 the internet and other related technologies, products and services can be bought and sold anywhere in the world, no matter how large or small is the enterprise. Product and service information is available on a real-time basis and price and quality comparisons can be made quickly. The internet allows businesses, both small and large, to expand their global presence at a lower cost than ever before.

4.2.2 More efficient transportation modes

Transport is one of the most 'visible' elements of logistics operations. Efficient transport management both in respect of procurement and distribution is one of the basic tasks in SCM. Firms must allocate the supplies to an adequate number of vehicles, indicate the appropriate sequence of calls at specific customers and select optimised routes. The transport technologies commonly used in the logistics industry include real-time transport information systems, the Geographic Information System (GIS), the Global Positioning System (GPS) and radio-frequency communication system (Koźlak, 2009).

Using 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). Railways use microwave technology to manage and track train movement, airlines use sophisticated avionics to manage the flight of their aircraft, ocean vessels use onboard computers to navigate domestic and international waterways, motor carriers use onboard 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 (Coyle et al., 2000; Li et al. 2003).

4.2.3 Improved warehousing technology

In warehouses, bar coding technology was introduced to improve order picking and fulfillment time. It is still the most frequently used automatic identification system, but the role of Radio-Frequency Identification (RFID) systems is on the increase. This offers

significantly greater possibilities than bar codes can. The basic benefits from use of RFID technology include saving the time required for scanning and operational improvement, due to greater accuracy of reading and a smaller number of scanning errors.

Scanning equipment at pick up, automated distribution terminals and delivery allow customers to track and trace consignments in the system via the internet (Examples of Functionality, 2011). 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 et al., 2003; Sauvage, 2003).

An innovative technology used in warehouse management system is voice control system. This receives input data from WMS system, such as order packaging lists or requests to replenish stock and uses voice technology to instruct the workers which products to pick and from which warehouse location (Koźlak, 2009).

4.2.4 More powerful IT

- The use of IT has grown exponentially from the 1980s. This soon had a massive impact on all business areas, transportation and distribution in particular (Lewis and Talalayevsky, 2000; Milligan, 2000). The adoption of IT is a major concern for logistics managers. Reasons for the exponential growth in the use of IT, apart from the dramatic reduction in the cost of IT over the last decade, are that it allows (Sangam, 2006; Sohail and Al-Abdali, 2005).
- Significant reductions in assets, such as inventories and equipment.
- More effective management of information, products and cash flows among supply chain partners; besides the

A very important aspect of using information technologies is that building integrated systems supporting the management of different areas of operation and enterprises now use IT systems for this purpose on a wider and wider scale. The newly implemented IT systems are characterised by greater capacity in respect of the volume and speed of data processing. This applies both to integrated information systems in a single organisation and to network systems (Koźlak, 2009).

4.2.5 Current and future IT based services

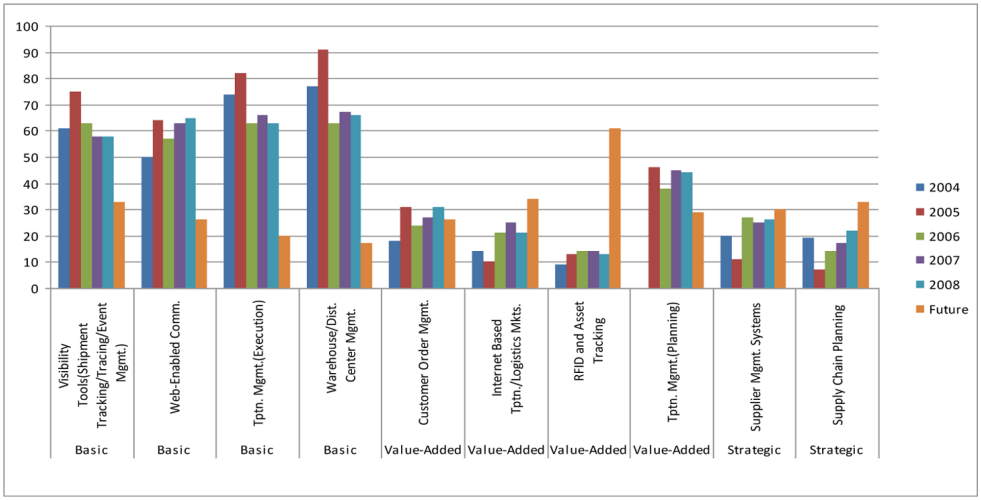
From 2004–2008, IT use continued to incorporate a shift in technology adoption towards an increased use of IT based services in logistics, in particular value added services (such as internet based transportation and logistics markets and RFID) and strategic services, such as supplier management systems and supply chain planning (Figure 1).

In 2008, web enabled communications and visibility tools were considered highly favoured IT services by logistics users, closely followed by warehouse and distribution centre management and transportation management and execution. Data from Figure 1 suggest that the IT based services implemented by companies are used primarily by late adopters and new enterprises.

Logistics players have many concerns in deciding to adopt a technology. For example, the UPS Asia Business Monitor (2008) report showed that Small to Medium Enterprises (SMEs) in Australia feel that a lack of knowledge and time are the most challenging factors hindering their adaptation to the digital age. The Logistics Institute Asia Pacific (TLI-AP)

team suggests that technology adoption might be a complex decision and decision makers have to make a trade-off between the benefits of adopting a certain technology and the cost of doing so. One example of this is Radio Frequency Identification Technology (RFID). Considered to be quite unique, it is considered in many studies to be widely considered by many logistics players. According to the 3PL studies in 2005 and 2006, RFID was the technology with the highest future expectations. However, the 3PL study 2007 claimed that these high expectations were not fulfilled and there was no growth in actual use from the figures for 2005 and 2006.

Figure 1 IT based service 2004–2010 (see online version for colours)



Source: Langley (2004, 2005, 2006, 2007, 2008, 2009; 2010)

The high demand for visibility tools seems to promote the use of RFID. The benefits of RFID are obvious: more responsive and better quality services. Specifically, RFID implementation involves an opportunity to critically examine business processes which can be re-engineered with the goals of increased data automation and error reduction to reduce mis-shipments, lost inventory and redundant data reads. Benefits derive from a reduction in manual processes through automated scanning and data entry improves productivity, thus allowing resources to be reallocated to higher value activities. However, RFID is a significant business investment for most organisations requiring a commitment to a particular solution and the dedication of resources and funding to implement the project. Today, RFID technology is still being adopted very slowly and the relatively large investment in adopting RFID and uncertainty on the ROI makes future adopters hesitant.

The number and types of technology intended to facilitate logistics operations continue to grow at a rapid pace. However, certain technologies have become critical components of 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% of all transactions between carriers and

their customers are estimated to be dealt with over the internet (Stock and 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 the 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. However, issues of capacity and security are still challenges to the use of the internet for transportation and distribution transactions (Li et al., 2003).

In logistics, internet platforms enjoy the growing interest of other enterprises than those directly connected with the industry. Such internet platforms for the fast and effective solution of logistic tasks in the road transport of goods are transport exchanges. Consignors, carriers and logistic operators use exchanges to gain access to a wide range of logistic services; they can buy and sell cargoes, loading space in vehicles, etc.

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 documented by Stock and Lambert (2001). Although the use of EDI has its problems, including hardware/software compatibility, consistent formats, security, high investment costs, senior management doubts and ownership, it has become widely used to increase firms' 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 makes data collection more accurate, speeds up receiving operations and the labour of data collection and helps to integrate data collection with other areas, leading to better database and inventory controls (Li et al., 2003). The development of bar code reading techniques and a drive to include in the code as much information as possible led to the creation of a new code type with considerably greater density of data recording. The 2D code makes it possible to store much more data without enlarging the code area. In addition to digits, it can contain a graphic entry or even sound. One 2D code may accommodate up to 3,500 symbols while a linear code can store up to 50 symbols (Tot.Net, 2011).

Track and trace

RFID allows users to relay information via electromagnetic energy waves from a terminal to a base station linked in turn to a host computer, which translate into onboard 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 and to identify the precise location of shipments. Through this same onboard capability, a driver has access to computerised capabilities, such as global positioning which provides real-time knowledge of a good's 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. If used 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 divided into four groups (Haverly and Whelan, 1996):

1 *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

2 *Traffic routing and scheduling*: provides features such as the sequence and timing of vehicle stops, route determinations, shipping paperwork preparation and vehicle availability

3 *Freight rate maintenance and auditing*: maintains a database of freight rates used to rate shipments or to perform freight bill auditing

4 *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 processes with a system where all information is online (including the invoice image) and distributes this information instantaneously using electronic means. The key benefits of e-Flow are (Star Track Express, 2003):

- faster approval of purchases and invoices
- protection against lost paperwork
- more effective reporting
- control of over purchasing.

e-Ports

An Australian designed and developed service is e-Ports ‘showing the way’ in the use of e-commerce techniques to improve container terminal productivity. Currently e-Ports 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 the lodgement of online export receipt documentation.

e-Ports permit industry to have access to real-time container tracking, together with as a range of reports tailored to the requirements of particular types of business (Showing the Way, 2004). The level of technology used 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 (Cabdoi, 2003; Frost and Sullivan, 2003; Sahay and Mohan, 2006). The above discussion highlights the complexity involved in the SCM function by technological innovation, which in turn must be dealt with by a growing number of expert specialists. In the next section we define and describe the notion of 3PLs and evolving 4PLs and speculate on the possible form of 5PLs as they emerge.

4.3 Driver 3: changing landscape of LSP services

LSPs are most commonly categorised in terms of the services that they provide on a continuum of asset intensive activities to IT intensive activities (De Souza et al., 2008). Table 1 illustrates the services provided by the LSPs categorised as basic services, value added services and strategic services.

Table 1 Major services outsourced to 3PLs

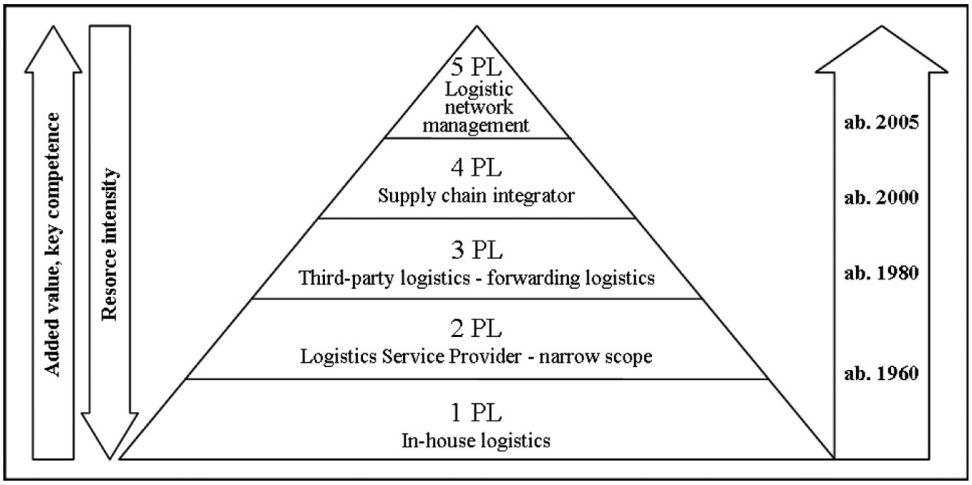
Asset Intensive		**IT Intensive**
Basic services	*Value added services*	*Strategic services*
Customs clearance	Factoring	Distribution control
Customs brokerage	Cross checking	Procurement of logistics services (3rd party)
Freight forwarding	Freight bill auditing/payment	Carrier selection (3rd party)
Inbound transportation	Return/reverse logistics	Rate negotiation
Outbound transportation	Order fulfilment	4pl services
Warehousing	Order entry/Order processing	Supply Chain Management (SCM)
Customer service	Customer service	Inventory ownership
Tracking and tracing	Event logistics	Inventory management/ replenishment
Shipment(freight) Consolidation/distribution	Project logistics	Information Technology (IT)
Fleet management	Co-manufacturing and co-packing	Supply chain and logistics information systems
Scheduling	Billing and ordering	Traffic management/ Fleet Management/Operations
Packaging and labelling	Cross-docking	Consulting services

The basic services are commodity-like services which include transportation and warehousing. Such services are provided by the asset based transportation LSPs. At the other end of the LSP spectrum are the IT intensive LSPs. Langley (2007) notes that technical services are increasing every day in importance and visibility. Firms offering basic IT capabilities such as

order entry/processing and fulfilment, visibility tools (event management) and web enabled communications are significant players in the LSP environment. Fewer players offer these value added services than asset based services. However, more LSPs are moving towards IT based value added services in response to customer needs. Such value added services are transportation services which do not require LSPs to own physical assets. Such services are provided by asset lighter transportation LSPs, who may own some assets, but are also IT intensive. They tend to develop longer term relationships with their customers than do asset based LSPs, who are more transactional.

The strategic services are related to the management and control aspects of logistics operations. Such services are provided by the asset lighter LSPs who focus on the SCM section in the continuum of logistics services. These LSPs are IT intensive. However, their business model differs from that of the value added IT intensive firms. Along with IT capabilities, these firms offer strategic logistic services such as procuring logistics services and 4PL services. The firms which offer such strategic services are now emerging from among the LSPs and are the most differentiated of the three models of 3, 4 and 5 party LSPs (Fig. 2).

Figure 2 Forms of outsourcing of logistics services



Source: Koźlak (2009, p. 128)

5 3PL, 4PL and 5PL logistics providers

5.1 Third party logistics providers: 3PLs

3PL firms provide outsourced or logistics services to companies for one aspect, or sometimes all, of their SCM functions. 3PL logistics providers typically specialise in integrated warehousing and transportation (Joseph et al., 2011; Sohail and Malikakkal, 2010). These services are capable of being systematically scaled and customised 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):

1 *Standard 3PL providers* are the most basic form of 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.

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

3 *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.

4 *Customer developers* offer 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 a few providers.

5.2 Fourth party logistics providers: 4PLs

In 1996, Accenture™ first coined and registered the term 4PL as a trademark (Li et al., 2003, p.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, p.45).*

4PLs may be considered a refinement and extension of the 3PL concept. One distinction of 4PL lies in its capacity to "create unique and comprehensive supply chain solutions that cannot be supplied or achieved by any single provider." (Li et al., 2003, p.839). Essentially, a 4PL is an

> *"integrator that assembles the resources, capabilities and technology of its own organization and other organisations to design, build and run comprehensive supply chain solutions" (Li et al., 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 to satisfy aspects of, or sometimes all, of their SCM functions. Much emphasis is placed on the 4PL provider's 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 the principle of being 'neutral' in selecting shipping partners. The goal of 4PL is to achieve benefits beyond the one time operating cost by reducing the 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 otherwise take years to duplicate. 4PL markets are expected to generate substantial revenue growth in Western Europe from approximately €4.7 billion in 2002 to about €13 billion by 2010 in the chemicals, electronics/high tech and automotive sectors (Frost and 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 and 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% of US companies using 3PL services report using multiple 3PL providers (Richardson and Vitasek, 2005). At one stage, Lucent Technology had 1,700 3PL providers (Schwartz, 2003). The increased 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) preferred to describe 4PL as 'outsourced outsourcing' while Schwartz (2003) has suggested that 4PL is actually 'extreme outsourcing model' presenting sophisticated, highly coordinated solutions for l outsourcing logistics. As indicated in Figure 3.

5.3 Fifth party logistics providers: 5PLs

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 probably impact on the increasing spread of this phenomenon. Distribution and transportation, like purchasing and customer service, are critical functions of SCM which have greatly impacted on economic systems in recent years. Considerable changes continue to occur in SCM, including the evolution of 3PL and 4PL services. The evolution of 3PL, 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.

5PL is essentially an outsourcing model adding to the logical progression in the development of full logistic integration. The concept of 5PL was proposed in a Morgan Stanley report which focused on providing e-logistics solutions for the entire supply chain (Ho and Lim, 2001). In this conceptualisation the electronic coordination of supply chain and information ownership are emphasised.

There is no consensus on what 5PL means. In the literature, there are varying approaches to activities attributed to 5PL providers. This ranges from emphasizing a quite simplified 5PL model interpretation, originates from lower logistics levels, to a full service e-business market capable of managing all links in the e-commerce supply chain.

5PL providers manage at the strategic level by a focus on providing innovative logistics solutions throughout the entire supply chain. The key to success in these endeavours is the effective integration of IT and computer systems. Other terms used for providers who manage all parties in the supply chain in an e-business market are 'virtual LSPs or 'infomediaries' (Regan and Garrido 2002).

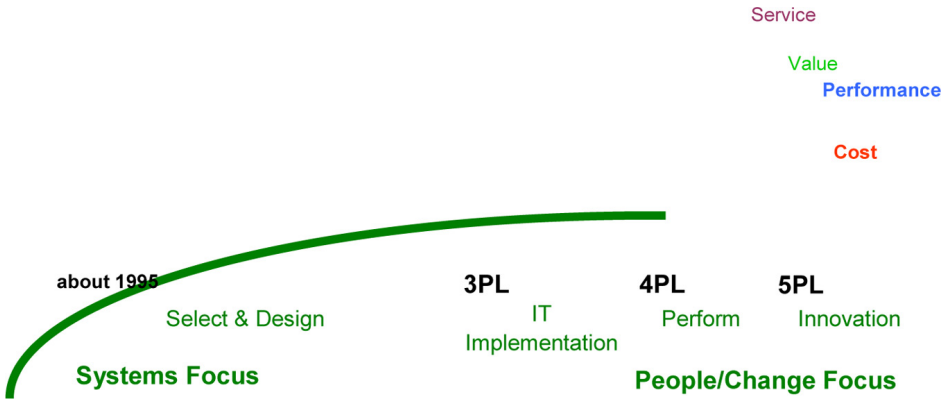
More recently, 5PL providers have become regarded as virtual entities which manage the supply chain at a strategic level. The major tasks of 5PL companies include mapping and reengineering the supply chain, the 4PL functions (integration and control of transport, handling, warehousing, etc.,) and providing integrated information systems to ensure real-

time visibility and control of the entire supply chain. 5PL operates on both a feedforward and feedback basis in order to complete the visibility cycle of materials at any point in the overall supply chain. It concentrates on acquiring the necessary skills to manage and coordinate the operations of other providers of services by means of dedicated information solutions associated with the demand and supply sides through electronic logistic services markets. The intention is to develop and implement flexible supply chains of a network type to satisfy the demand from all partners, including manufacturers, suppliers, carriers and buyers.

5PL organisations are almost fully virtual. As such, these types of entity possess no typical assets. They have no physical presence but constitute a web-based system which provides information to the chain of participants under its control. Individual participants manage various supply chains in the network on the basis of the information received in real-time from 5PL. The purpose is to achieve best-of-breed solutions in such logistic services as transport, forwarding, warehousing and so forth. The development and coordination of specific supply chains and their transformation into supply networks involves the formation of virtual corporations (Gattorna et al., 2004). Networked participants can derive greater benefits from the visibility of flows in real-time and economies of scale, achieving better efficiency and lower costs impossible to achieve using 3PL services.

In recent years progress has been made into research about 5PL. Hamilton (2004) has discussed the progression in logistic outsourcing and 5PL level in conjunction with the development of multinational enterprises. Developments in networked internet linkages, intelligent database interrogation software (Fig. 3), alliance partnerships and outsourcing have moved leading edge multinational enterprises towards 5PL services. The full expression of the 5PL level of service outsourcing has been conceptualised as a fully activated demand-supply logistics model (5PL FADS model) presenting sophisticated, highly coordinated solutions for l outsourcing logistics.

Figure 3 Evolution of 5PL service providers (see online version for colours)



With the more aggressive competitive global environment (Hill, 2003), SCM offers much 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 the on-going technological innovation, means

that SCM is becoming increasingly complex and hence, far more challenging for managers. Increasing populations and economic growth have increased the demand for energy and transportation, with resulting environmental consequences. The benefits of an 5PL roadmap are in the form of innovation in service, performance, cost and supply chain value, which with 4PL services are limited (Al-Kharusi, 2010).

6 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 the elusive competitive edge, technological innovation and security, environment and energy concerns, are 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 and 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 (Frost and Sullivan, 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 (Bleek and Ernst, 1993; Ohmae, 1989; Rugman and Verbeke, 2003; Smith et al., 1995). Despite the proliferation of interfirm network partners, however, interfirm networks are problematic. Buttery and Buttery (1994) suggest that perhaps 30–70% of interfirm linkages are unsatisfactory. This is a rather disturbing statistic for any firms considering outsourcing their SCM function, because of the close strategic link between the organisation and the 4PL service provider and the need to share sensitive information.

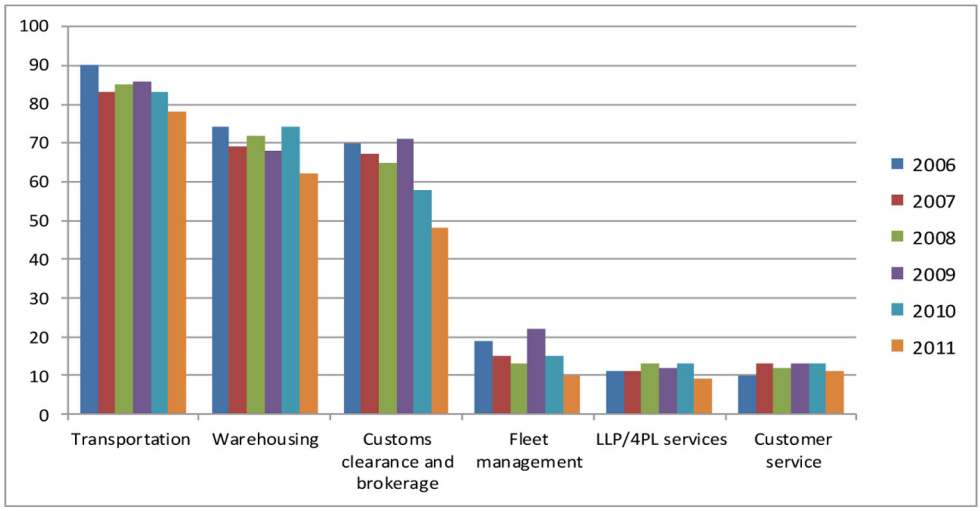
Managers also need to be aware of the risks of outsourcing 4PL services, including Burt et al. (2003), Elliff (2004), Leenders et al. (2002), Richardson and Vitasek (2005):

- *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
- *Lock-in or dependency*: difficult to change partners should the interfirm linkage prove unsuccessful.

Contemporary LSPs can provide overall solutions of integrated logistics services to their customers. However, many customers still prefer to keep most of the logistics process in house, outsourcing only the most basic services of warehousing and transport to LSPs. This trend is also reflected in the study of Third Party Logistics (3PL) by Langley (2006; 2007; 2008; 2009; 2010; 2012) which revealed that warehousing and transportation remain the most popular services that customers are currently using (Fig. 4). In contrast, higher level,

Fourth Party Logistics (4PL) have consistently been one of the least favoured services in the eyes of customers for the past six years. These findings suggest that customers are slow to adopt services beyond the basics of warehousing and transportation.

Figure 4 Logistics services currently outsourced (all regions) (see online version for colours)



Source: Langley (2006; 2007;2008; 2009; 2010; 2012)

4PL service providers are prone to be descended from 3PL providers. For example, FedEx, UPS, TNT and DHL are all players in both 3PL and 4PL (Express Transport Companies' Shift to 4PL, 2011). Despite 4PL service providers being portrayed as ostensibly neutral (Craig, 2003, p.2), it does raise a serious conflict of interests, in that a 4PL service provider will most likely form partnerships with its 3PL divisions. Overall, the system may be more effectively managed than an insourced option, but may not necessarily be optimised.

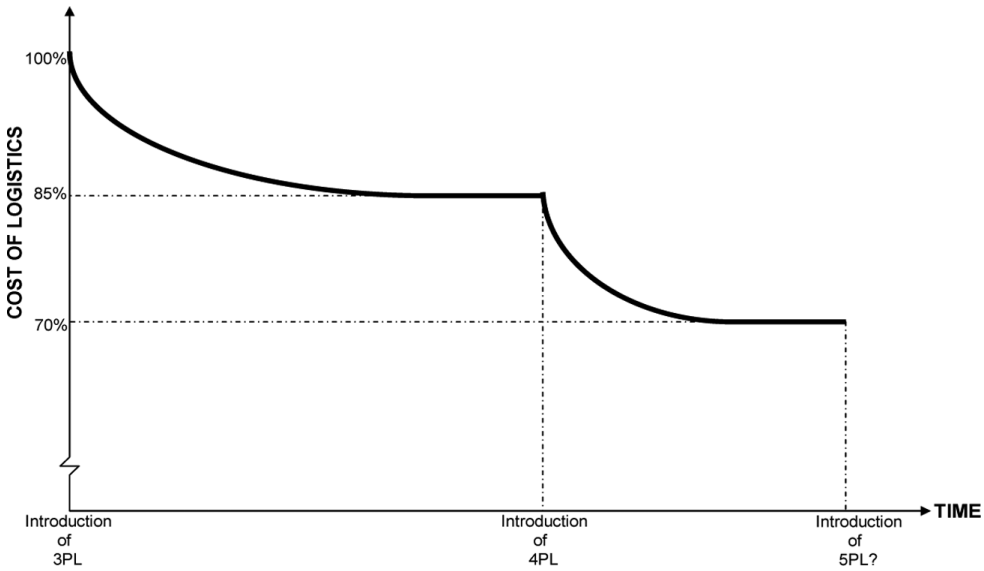
These risks highlight the need for managers intending to outsource SCM to trust the service provider enough to share sensitive information if cross corporation and cross cultural relationships are to be effectively managed. A predetermined exit strategy is essential if the partnership does not prove 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.

Celestine (1999) reported that firms may save between 15% and 25% 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 greater 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). Another study showed logistics cost reductions in the range of 12–15% (Langley, 2008). 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 and Vitasek, 2005). Figure 5 graphically displays the cost reductions evident with the sequential introduction of 3PL and 4PL solutions.

In the constant search for global competitiveness, Figure 5 raises 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 whether the cost involved in deploying innovative solution can 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 that a competitive edge is maintained. Incremental gains in cost reductions and efficiencies may be enough to justify the investment in such systems.

Figure 5 Cost of logistics over time (Hosie, Egan, Tan &Li)



This being the case, the next significant strategic initiative in SCM may be the '5PL' service provision. This would entail the 'transaction cost analysis' (Heide and John 1988) 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 which have become apparent in the 3PL and 4PL systems and also 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 3PL and 4PL are also likely drive the adoption of 5PL. Frost and Sullivan (2003) identified the need for an even greater emphasis to be given to customers whose requirements will become far more demanding. Shippers who enter a logistics outsourcing project want a single point of contact with one company and supply chain visibility. Customers will increasingly demand more strategic, solution driven results, as shown in Table 2.

Many of the issues identified with the implementation of 4PL may well continue to militate against successful development and adoption by firms of potential 5PL services (Cabdoi, 2003). One of the problems with introducing 3, 4 and 5 PL service providers has been the adoption of sophisticated and complex services without regard to established business strategies (Hertz and Alfredsson, 2003). According to Hertz and Alfredsson (2003) a recurring problem with the move to 4PL business is the greater need to maintain a neutral

position than there was in traditional business modes of operation. Another issue associated with 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 vital for the understanding and developing of business alliances between firms and 3PL providers. These business issues are likely to impact on any extension of 4PL into a future notion of 5PL.

Table 2 Comparison between 3PL, 4PL and 5PL

	3PL	*4PL*	*5PL*
Asset basis	*Asset based*	*Non asset based*	*Not specific*
Role	Basic logistics services	End to end coordination	Innovative and integrated logistics services
Business impact	Maximised use of resources	Assurance of high supply chain reliability	Using innovative solution to optimise processes
Key performance metrics	Cost	Reliability	Productivity / Costs

6.1 Trust matters

Cost considerations are merely one aspect of the control mechanism in interfirm relationships. Increasing dissatisfaction with the scope of 3PL and 4PL services, coupled with the greater complexity of supply chains, is 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, it facilitates familiarity and leads to commitment in the relationship (Kramer, 1999; Lorenzoni and Lipparini, 1999; Madhok, 1995; Rodriguez and Wilson, 2002). This is true for any form of interfirm linkage, including 4PL and proposed 5PL services (Knemeyer and 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 that trust between the parties is crucial for relations requiring economic, physical, technological, knowledge and social exchange. Relationships of this nature tend to continue 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 likely to succeed only 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 can combine to aggregate available 'inside' and

'outside' resources (Li et al., 2003). Customers will have to be convinced that perceptible added value will be provided by new types of working arrangements, because 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 the internal dynamics of organisations.

Long term strategic partnerships will be required to ensure that major risk internal transformations do not constitute an unacceptable exposure to risk for both the supplier and the customer. Competitive pressures will continue the push to enhance the use of 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). Optimised web and internet based technology will continue to provide considerable opportunities for businesses to leverage multiple supply chain processes and effectiveness (Li et al., 2003).

Greater competitiveness in the transport industry has created higher quality value added services, further supply chain integration and strategic partnerships. Alliances, mergers and acquisitions between 5PL providers 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 supplier and customer are critical to generating much value in such partnerships. A continuing challenge for prospective 5PL providers will be to balance the capacity to be flexible for individual customers with the systems to coordinate and serve the needs of multiple customers (Hertz and Alfredsson, 2003).

7 Conclusion

Dynamic developments in logistic management thinking and practice were addressed in this critique. A synthesis was undertaken of the diverse and historical issues which 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. There is a long standing need for a comprehensive and holistic approach to the fulfilment of the most intricate and complex supply chain requirements across the entire spectrum of logistics. Debates continue on the roles and capabilities of the different players in the industry, largely because of disparate definitions of scope and varying degrees of depth of expertise. One of the drawbacks of this concept is that 5PL may not achieve the claim of improving supply chain efficiency and effectiveness in the form of cost, service, performance and value.

One critical aspect of the soft skills required is the capacity to develop and maintain a sense of *trust* on the commercial, operational and personal levels. Thus, it would appear that future 5PL service providers will need to demonstrably gain and maintain a holistic and innovative SCM to achieve a competitive edge for clients.

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