

INTEGRATED LOGISTICS STRATEGIES

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1. Introduction

Integration has been one of the dominant themes in the development of logistics management. This development began around 40 years ago with the integration at a local level of transport and warehousing operations into physical distribution systems. Today, many businesses are endeavoring to integrate supply networks that traverse the globe, comprise several tiers of supplier and distributor, and use different transport modes and carriers. The process of integration has transformed the way that companies manage the movement, storage, and handling of their products. Traditionally, these activities were regarded as basic operations subservient to the needs of other functions. Their integration into a logistical system has greatly enhanced their status and given them a new strategic importance.

While logistical activities have been undergoing this fundamental restructuring, companies have been placing greater emphasis on the formulation of strategy. Business strategy has become a very fertile field of research and consultancy work, generating many new ideas, approaches, and conceptual frameworks. This has affected logistics management in two ways. First, much of the output of this research has been directly applicable to logistics, helping managers devise strategies specifically for the logistics function. Second, several of the most influential company-wide strategic models, such as that of Porter (1985), have identified a central role for logistics and confirmed that it can make a major contribution to the competitiveness and growth of a business. The real challenge is now to ensure that logistical strategies are aligned with the broader strategic goals both of individual businesses and groups of companies linked together in a supply chain.

This chapter begins by reviewing the integration of the logistics function over the past few decades, showing how it has widened its scope from the distribution of finished products to the “end-to-end” supply chain and has been elevated from an

operational to a strategic level. The following sections examine the contribution that logistics can make to wider corporate strategy, the strategic options available to logistics managers, and the impact of logistical decision-making on the freight transport system.

2. A brief history of logistical integration

The process of logistical integration can be divided into four stages:

Stage 1. The first stage in the process is generally considered to have been the “revolution in physical distribution management,” which began in the early 1960s in the U.S.A. and involved the integration into a single function of activities associated with the outbound distribution of finished goods. Formerly, logistics “was a fragmented and often unco-ordinated set of activities spread throughout various organizational functions with each individual function having its budget and set of priorities and measurements” (Lambert and Stock, 1993). Separate distribution departments were created which, for the first time, were able to coordinate the management of transport, warehousing, inventory management, materials handling, and order processing. The integration of these activities within physical distribution management (PDM) had three beneficial effects:

- (1) It allowed companies to exploit the close interdependence between them, establishing a “distribution mix” which could meet customer requirements at minimum cost. In designing an integrated distribution system, they aimed to achieve an optimal trade-off between the costs of the various activities. Traditional accounting structures had prevented this in the past. The development of a new “total cost approach” to distribution accounting, which became a prerequisite of PDM, permitted much more detailed analysis of distribution costs. This often revealed, for example, that a large proportion of companies’ total output was being distributed in small quantities at a high delivery cost per unit. In pursuing their prime objective of maximizing revenue, sales departments were prepared to supply very small orders, in some cases at a loss. Once these inefficiencies were exposed, companies began to raise minimum order sizes, stopping deliveries to small outlets and effectively rationalizing their delivery networks (McKinnon, 1989).
- (2) It gave distribution a stronger customer focus. PDM was initially motivated by a desire to cut cost, reflecting the traditional view of distribution as simply a drain on companies’ resources. During the 1960s it was recognized that the quality of the distribution service could have a significant impact on sales, market share, and long-term customer loyalty (Stewart, 1965).

Distribution could therefore affect profitability on both the cost and revenue sides of the balance sheet. The new distribution departments began to develop more explicit customer service strategies based on closer co-ordination of order processing, warehousing, and delivery operations.

- (3) It raised the status of distribution within the management hierarchy. When identified as a function in its own right, distribution began to take its place alongside production, marketing, and sales, with its own budget and often separate representation at company board level. A new generation of managers was appointed to oversee the full spectrum of distribution activities and devise distribution strategies for their businesses.

Stage 2. PDM was initially concerned only with the distribution of finished products. The same general principle was subsequently applied to the inbound movement of materials, components, and subassemblies, generally known as “materials management.” By the late 1970s, many firms had established “logistics departments” with overall responsibility for the movement, storage, and handling of products upstream and downstream of the production operation. This enabled them to exploit higher level synergies, share the use of logistical assets between inbound and outbound flows, and apply logistical principles more consistently across the business (Bowersox, 1978). Fabbes-Costes and Colin (1999) use the term “integrated logistics” to describe the co-ordination of inbound supply, production, and distribution. They also differentiated later phases in this process, where logistics extends its influence upstream into product development and downstream into after-sales service and the recycling and disposal of waste. They called the culmination of this process “total logistics.”

Stage 3. Having achieved a high level of integration within the logistics function, many firms tried to co-ordinate logistics more closely with other functions. Most businesses have a “vertical” structure built around a series of discrete functions such as production, purchasing, marketing, logistics, and sales, each with their own objectives and budgets. These functions are often represented as “silos” or “stovepipes” (Christopher, 1998). Senior managers often put the interests of their functions before the profitability of the business as a whole. Under these circumstances, logistics can play an important co-ordinating role, as it interfaces with most other functions. As Morash et al. (1996) observe, “the strong boundary spanning role found for logistics implies that logistics can be used as a vehicle for cross-functional integration, a nexus of communication and co-ordination, and for better system performance.” They argue that “functional boundaries need to be made flexible and virtually transparent in the pursuit of cross-functional excellence.”

With the emergence of business process re-engineering (BPR) in the early 1990s (Hammer and Champy, 1993), the relationship between logistics and

Table 1
Core business processes

Christopher (1998)	Hines (1999)	
	Electrical distributor	Chemical producer
Order fulfillment	Order fulfillment	Strategic management
New product development	Supplier integration	New business development
Marketing planning	Sales order acquisition	Customer support
Information management	New product introduction	Order fulfillment
Profitability analysis		Cost management
		Quality and environmental management
		Continuous improvement

related functions was redefined. BPR identifies a series of core processes that cut across traditional functional boundaries and are essentially customer-oriented. Effective management of these processes requires the development of new working relationships between functions and the formation of more cross-functional teams. These are acknowledged to be core processes which drive the typical business, of which order fulfillment, the *raison d'être* of all logistics operations, is arguably the most important (e.g., Christopher, 1998) (Table 1). As Hines (1999) points out, however, the range of key processes and their relative importance can vary between sectors and companies (see Table 1).

Bowersox and Closs (1996) have adapted the principles of BPR to logistics, emphasizing four factors “common to all logistical reengineering initiatives.” The first and most important is “systems integration.” The authors argue that “a logistical system with cross-functional integration should achieve greater results than one deficient in co-ordinated performance,” although they concede that “effective application of systems integration in logistics is operationally difficult.” The other three factors are benchmarking, “decompositional” analysis of individual logistics activities, and the quest for continuous improvement.

Stage 4. All the developments discussed so far have related to the management of an individual business. If all the businesses in a supply chain optimize their logistical activities in isolation, it is unlikely that the flow of products across the supply chain will be optimized. To achieve wider, supply chain optimization it is necessary for companies at different levels in the chain to co-ordinate their operations. This is the essence of supply chain management (SCM). The main driver of SCM over the past 20 years has unquestionably been the desire to minimize inventory. Supply chain (or “pipeline”) mapping has shown that much of the inventory in a supply chain is concentrated at “organizational boundaries,”

where products are transferred from one company to another (Scott and Wesbrook, 1993). Uncertainty about the behavior of suppliers and customers causes firms to accumulate buffer stock. More open exchange of information and closer integration of logistical activities enables companies to cut lead times and reduce stocks, to their mutual advantage and the benefit of the supply chain as a whole. For example, Lewis et al. (1997) cite the case of a medium-sized manufacturer of mechanical/electrical equipment which doubled its stock turn (from four to eight times a year) and raised its inbound delivery service level from 60% to 98% by “re-engineering its supplier interface.” While there has been some acknowledgement of the role of freight transport in the development of successful supply chain links (Gentry, 1995), this subject has attracted little research. Members of an integrated supply chain should collaborate to maximize vehicle load factors, minimize empty running, achieve an optimal allocation of freight between modes, and standardize on handling systems that make effective use of vehicle and warehouse capacity (European Logistics Association, 2000).

It is difficult to define the exact chronology of the process of integration as it has diffused at different rates across industrial sectors, countries, and company size categories. There are still many small and medium-sized business which have yet to embrace fully the principles of PDM and whose distribution management is still highly fragmented. While at an individual company level the process of logistical integration has proceeded at varying rates, the sequencing of the four stages has been more regular. There is general agreement, for example, that companies must integrate their internal logistics operations before attempting to link these operations with those of external suppliers and distributors.

Stevens (1989) has examined the nature of the transition between the various stages of integration and noted that different factors dominate at the each stage. He argues that the application of new technology has been the principal force in moving firms from stage 1 to stage 2, which he calls “functional integration.” The transition to stage 3 (internal integration) involves primarily a change in organizational structure, while to attain stage 4 (external integration) management must undergo a major attitudinal change.

It is also worth noting that the multistage integration of companies’ logistical operations has been reflected in the out-sourcing of logistical activities. While this process of integration has been underway, companies have been externalizing an increasing proportion of their logistics spend (McKinnon, 1999). Traditionally, they would out-source activities such as transport or warehousing on an individual basis. During the 1970s and 1980s it became common for firms to contract out their entire distribution operation, particularly in those countries with deregulated road freight markets, such as the U.K. In some cases, the processes of out-sourcing and integration were concomitant, with much of the responsibility for combining the various activities entrusted to third-party operators (Cooper

and Johnstone, 1990) More recently, there have been examples of large manufacturers and retailers employing a single contractor to manage their inbound as well as outbound logistics. There is now a growing demand from multinational businesses for the services of logistics providers capable of integrating their global supply chains (Datamonitor, 1999).

3. Strategy formulation

The role of strategy is to “guide the firm in its efforts to develop and utilize key resources to achieve desired objectives within a dynamic and challenging competitive environment” (Fawcett et al., 1997). In a monograph for the Council of Logistics Management, Cooper et al. (1992) outline the process of strategic planning as it might be applied to the logistics function. They summarize this process as “identifying the long-term goals of the entity ... and the broad steps necessary to achieve these goals over a long-term horizon ... incorporating the concerns and future expectations of the major stakeholders.” These goals can be defined at different levels and are usually based on a wide-ranging audit of a company’s capabilities and market opportunities. At the highest level are broad corporate goals affecting the positioning of a business within its competitive environment. In companies, which have reached the third stage of integration, the logistics function will be represented in the corporate planning team, ensuring that the logistical implications of each strategic option are properly evaluated. The corporate plan drawn up to achieve these goals will define a series of logistical requirements. It will often be possible to meet these requirements in different ways, introducing a degree of flexibility into the formulation, at a lower level, of the logistics strategy. At a lower level still, separate strategies can be devised for individual logistical activities, such as transport and warehousing. The planning process must ensure that strategies developed at the different levels are closely coordinated.

4. Corporate goals

At the heart of all business strategy lies the desire to achieve differentiation through cost reduction and/or value enhancement (Porter, 1985). These strategic options are typically represented by a simple matrix showing four combinations of high and low ratings for cost and added value (Figure 1). By common consent, the least competitive businesses will be found in cell 1, supplying low value, undifferentiated products at relatively high cost. The most competitive companies produce high value, well-differentiated products at relatively low cost, and thus occupy cell 3. Intermediate positions are held by companies placing an emphasis

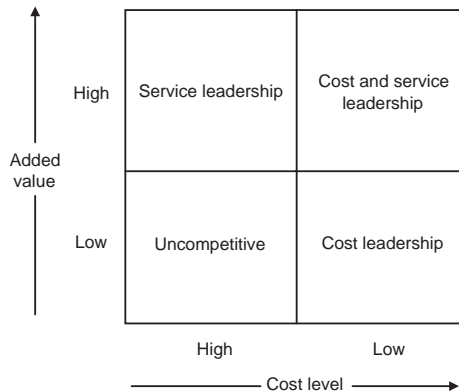


Figure 1. Strategic positioning (adapted from: Christopher, 1998).

on minimizing cost (cost leaders) or maximizing value (service leaders). Various attempts have been made to classify businesses with respect to these two criteria and to plot changes in their relative position in the matrix over time.

5. Value enhancement

Effective logistics management can help companies to gain competitive advantage through both value enhancement and cost reduction. The first of these is discussed in this section, and cost reduction is discussed in Section 6.

5.1. Product diversification

One of the most effective means of adding value to a product or service is to tailor it more closely to individual customer tastes and requirements. This involves extending the range of products or services available. The proliferation of products has major implications for logistics. There is generally a close correlation between the number of separate product lines (or stock-keeping units (SKUs)) in a company's logistical system and the amount of inventory that must be held. Highly diverse product ranges also require more complex warehousing, handling, and information systems. The process of customization can further complicate the logistics operation. It has become increasingly common for multinational manufacturers to defer the final customization of their products until they reach particular continental or national markets, in some cases adding an extra link to the supply chain (Cooper, 1993).

5.2. Development of higher value products

Higher value products are often inherently more fragile and perishable, requiring more packaging, more careful handling and, often, temperature control. More expensive products also need tighter security and are more expensive to insure while in transit. Many of the new higher value consumer products developed over the past 20 years have production and distribution systems that are intrinsically more complex and geographically extensive than those of their predecessors.

5.3. Improved service quality

Business customers and final consumers are usually prepared to pay more for faster and more reliable delivery. They also attach higher value to products supported by good after-sales service. Logistical services can therefore be used to augment the basic product and help companies differentiate their offering from that of competitors.

6. Cost reduction

A recent survey of “over 200” European companies found that logistics costs represent, on average, 7.7% of sales revenue (A.T. Kearney, 2000). In some sectors, this proportion can be two or three times higher. By improving the productivity of logistics operations it is possible to cut this cost and translate some of the savings into lower prices. Over the past 20 years, the largest saving in logistics costs has accrued from a reduction in inventory levels (relative to sales). This has been achieved by the move to just-in-time/quick response replenishment, the centralization of inventory, the application of new IT systems, and the development of SCM. There have also been substantial improvements in the efficiency of freight transport operations, resulting mainly from the upgrading of transport infrastructure, liberalization of freight markets, and improved vehicle design. Warehousing costs per unit have also declined in real terms as a result of scale economies, increased mechanization, and the diffusion of new computer-based warehouse management systems (see Chapter 34). The combined effect of these trends has been to reduce the proportion of revenue spent on logistics by European firms by an average of 46% between 1987 and 1999 (A.T. Kearney, 2000).

These cost reductions were achieved during a period when product ranges were expanding and service quality steadily rising. There is little evidence of quality and value being sacrificed for cost savings, or vice versa. This is making it harder for companies to differentiate their offering in terms of both value and productivity, as benchmarks are constantly rising. Simply to remain competitive, companies are

under pressure to improve both service and cost performance. As Persson (1991) explains, “logistics ... has become a win-win strategy, improving performance, quality and productivity simultaneously.”

7. Logistical strategies

Several attempts have been to made classify logistical strategies. Persson (1991), for example, has identified three basic strategies and exemplified them with short case studies of Scandinavian companies. He calls them simply strategies 1, 2, and 3:

- (1) *Strategy 1.* Companies use logistics to “influence competitive forces” by (i) making suppliers or customers more dependent upon them or (ii) using heavy investment in a new logistics network to discourage other firms from entering a market sector. The specialist chemical supplier Merck, for example, has developed a distribution system in the U.K. that can deliver orders varying enormously in weight, from a few grams to a tonne, in an effort to become sole supplier (or a “one-stop shop”) to laboratories throughout the U.K.
- (2) *Strategy 2.* Companies, using existing resources, develop innovative logistics practices to penetrate new markets or gain competitive advantage in an existing market. The abandonment of fixed depot area boundaries, for instance, and the adoption of multi-depot fleet planning can strengthen a company’s competitiveness in a regional market by simultaneously cutting transport costs and delivery lead times (McKinnon, 1998).
- (3) *Strategy 3.* Companies aim for across-the-board superiority in logistics by “seeking new solutions and system combinations.” Such companies tend to regard logistics management as a core competence and key to future success.

An alternative typology advanced by Bowersox et al. (1989) has been much more widely quoted and subjected to greater empirical analysis. It was originally developed as part of a study of the links between logistics strategy and the organization of the logistics function. In its revised form, this classification differentiates three types of logistics strategy:

- (1) *Process-based strategy.* This applies to firms at integration stage 3 and committed to the cross-functional management of business processes. The emphasis here lies in improving the efficiency of a broad range of logistical activities.
- (2) *Market-based strategy.* This is concerned with a more limited group of logistical activities, often carried out by different business units, and aims to “facilitate sales and logistical co-ordination” by market sector.

Table 2
Interrelationship between strategic decisions and freight transport parameters

	Quantity of freight	Mode choice	Vehicle type	Vehicle utilization	Routing	Scheduling
<i>Product development</i>						
Product design	•	•	•	•		
Packaging	•	•	•	•		
Product range	•	•	•	•		
<i>Marketing planning/sales acquisition</i>						
Market area	•	•	•		•	
Marketing channels	•	•	•	•	•	
Sales strategy/promotion	•	•	•	•		•
<i>Order fulfillment</i>						
Location of production and distribution facilities	•	•			•	
Sourcing of supplies	•	•			•	
Production system	•		•	•		•
Inventory management	•	•	•	•		•
Materials handling	•	•	•	•		
After-sales service	•		•	•		•
Recycling/reverse logistics	•	•	•	•	•	

Key: •, a direct relationship exists.

- (3) *Channel-based strategy*. The aim is to improve the management of logistical activities performed jointly by supply chain partners.

A sample of 375 U.S. manufacturers were asked into which of these three categories their logistic strategy fell. Approximately 54% identified with the process-based strategy, 28% with market-based strategy, and only 9% with the channel-based strategy. McGinnis and Kohn (1993) tested the validity of this typology in two surveys in which managers were asked a series of questions designed to assess the strategic orientation of their logistics function. Cluster analysis of these questionnaire data indicated that the distinction between process-based and market-based strategies was meaningful. They further refined these strategies by distinguishing, in each case, three “substrategies.” A later survey by Clinton and Closs (1997) of over 1300 North American companies provided further empirical support for this typology. They used factor analysis to explore the interrelationship between 43 logistical variables to see if companies fell into reasonably coherent strategic groupings. They concluded that it was possible to detect differences in strategic emphasis and expressed “cautious optimism” that the typology proposed by Bowersox et al. was valid.

This classification is, nevertheless, highly generalized. The fact that it requires such a complex, multivariate analysis to produce strategic constructs that match the typology is in itself revealing. It highlights the multidimensional nature, and possibly uniqueness, of any strategies designed to cover the full spectrum of logistical activities. The need to tailor these activities to the particular circumstances of a business makes it very difficult to establish a series of generic strategies for the logistical function as a whole.

It is, however, possible to distinguish a range of strategic *options* relating to particular aspects of a logistical system. These are more clearly identifiable and measurable. A good example is the choice that companies must make between a postponement and a speculation strategy (Van Hoek et al., 1998). The geographical (or “place”) form of postponement involves centralizing inventory and delaying its dispatch to local markets until an accurate estimate of the likely demand can be made. Speculation, on the other hand, entails dispersing inventory to local markets in the belief that you will be better able to respond to short-term increases in demand. These contrasting strategies have been examined in detail and practical tools developed to help firms determine under what circumstances they are appropriate. Both Cooper (1993) and Pagh and Cooper (1998) have constructed simple matrices to show how the preferred strategy is likely to be influenced by the nature of the product and packaging, the geography of the market, and the manufacturing strategy.

8. The role of freight transport with integrated logistics strategies

Freight transport operations are affected by a broad range of strategic decisions made at both a logistical and a corporate level within the business. These decisions impact upon different aspects of the transport operation. Table 2 is an attempt to map the interrelationships between a set of six freight transport parameters and areas of strategic decision-making grouped in relation to the three core business processes identified above, namely order fulfillment, marketing planning/sales acquisition, and product development. The presence of a dot in a cell signifies the existence of a direct relationship.

This shows that the nature of the freight transport operation is the result of a complex web of decision-making, spanning different functional areas within the business. As a result of the process of integration at functional, corporate, and supply chain levels, the strategic context within which transport decisions are made has undergone a radical change over the past 40 years. Few studies have examined the effects of this change on the physical movement of freight. Little is known, for example, about the impact of BPR or the application of the postponement principle on freight traffic levels, the modal split, and vehicle load factors?

Of the freight transport parameters listed in Table 2, only the volume of freight movement has been analyzed in detail within an integrated logistics management context. It can be argued that freight traffic levels were influenced by four levels of logistical decision-making, relating to:

- (1) *Logistical structures*: numbers, locations, and capacities of factors, warehouses, terminals, and shops.
- (2) *Supply chain configuration*: patterns of trading links within the logistical structures.
- (3) *Scheduling of flows*: manifestation of the trading links as discrete freight movements.
- (4) *Management of transport resources*: relating to the choice of vehicle, utilization of vehicle capacity, routing of delivery, etc.

The growth of freight traffic is the result of a complex interaction between decisions made at these different levels. Decisions at levels 1 and 2 determine the quantity of freight movement measured in tonne-kilometers, while decisions at levels 3 and 4 translate this movement into vehicle traffic, measured in vehicle-kilometers. This decision-making hierarchy has been adopted by several EU-funded research projects (e.g., Demkes, 1999) and been advocated by the U.K. government's Standing Advisory Committee on Trunk Road Assessment (SACTRA) (1999) as a framework for future road freight forecasting.

9. Conclusion

Freight transport is an integral part of logistical systems and supply chains. Analysis of the nature, volume, and pattern of freight movement must therefore be rooted in an understanding of the way that these systems and chains function and evolve. This chapter has outlined the development of logistics management since the early 1960s, highlighting the different stages in its integration. Over the past decade, more formal methods of strategic planning have been applied at both the corporate and the functional level. Within the strategic planning process, there is now wide recognition that logistics is a major determinant of competitiveness, profitability, and growth. Over the next decade, globalization and the growth of e-commerce will further reinforce its position within the corporate hierarchy.

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