

Logistics at Large:

Jumping the Barriers of the Logistics Function

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Abstract

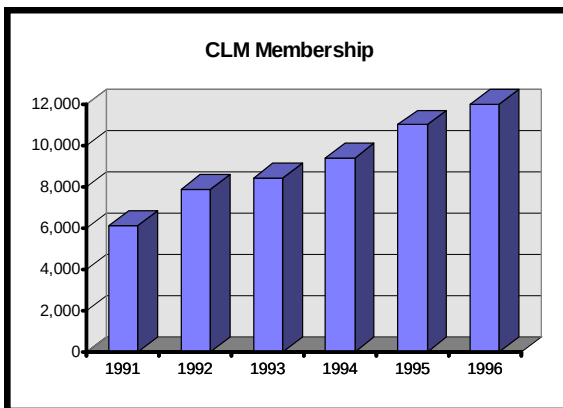
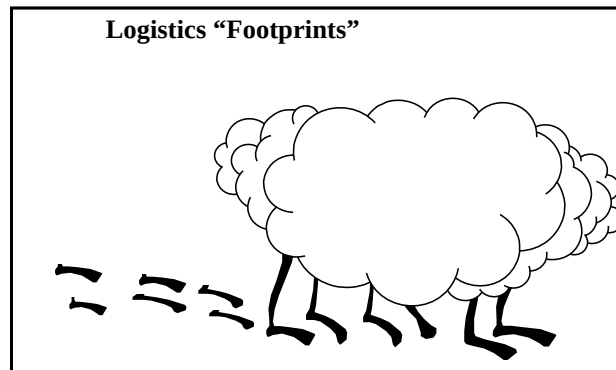
Despite the enormous strides of the logistics profession in the last twenty years, it is still neither widely recognized nor easily understood by business professionals outside it. In part, it is because the profession itself has not yet succeeded in providing a widely accepted and easily understood definition of the field and its thrust.

This paper presents a framework for thinking about logistics and its evolution, which might help to close this gap. It argues that logistics has been evolving in two major stages: from a focus on a collection of operational activities that define a function to a focus on coordination and flow management activities which give the profession an additional, much broader, identity.

This framework is then used to suggest a new definition of logistics -- one that reflects what advanced practitioners do and where we think the profession is heading. The new framework is then used to address certain logistics-related questions in new ways. These include a dichotomy of logistics companies; guidelines for contracting out logistics services; some thoughts on the required future skills; and some suggestions for teaching logistics.

The Footprints of Logistics

The importance of logistics has been continuously increasing and becoming evident over the last 20 years. The "foot prints" of logistics are everywhere: there is a growing community of people identifying themselves as logisticians; there is an increasing number of logistics books and publications devoted to it in the commercial and academic arenas; more business functions, corporate positions and service



enterprises include logistics in their title; membership in professional organizations, such as the Council of Logistics Management (CLM) and its international counterparts is growing steadily; and there are many stories of business success and significant competitive advantages associated with world class logistics activities.¹

The reasons for the growing significance of the profession are based on several well-

known challenges and opportunities. Some of the challenges include the following:

- The globalization of commerce has created the need to procure material and parts from far-flung locations and sell finished products globally. Furthermore, many global companies who truly manage operations worldwide have emerged, creating a need for intra-company international movements of material and increasing the importance of logistics-related decisions such as facility location.
- Recognition of the true costs of inventory has led many enterprises to decrease inventory levels, thereby creating tightly-coupled supply chains which can react faster but require more and different skills to put together and improve continuously. Furthermore, such tightly couples supply chains are more vulnerable to breakdowns and interruptions, thus requiring closer monitoring and higher skill levels to operate.

¹ A comprehensive survey of companies practicing world class logistics can be found in CLM (1995). Compare also recent winners of the German BVL logistics prize such as the OTTO Direct Merchandising Group, BMW, and SIEMENS' Private Telecommunications Division.

- Increasing customer expectations for ever better service, lower costs and more choices, have created a pressure to deliver products faster and cheaper and to react more nimbly to changing customer requirements. Furthermore there is an explosion of SKU-s in response to consumers' demand for variety meaning that, in addition to the complexity of size, corporations deal with more products, each of which is subject to higher random fluctuations since it targets a smaller niche.
- A new emphasis on environmental issues is leading corporations to manage the return of products after their use for recycling and/or safe disposal, and the deployment of re-useable containers which have to be managed
- Corporate realignment due to mergers and acquisitions and the emergence of extended enterprises mean that inbound and outbound networks have to be redesigned and tuned with increasing frequency.

The opportunities stem from the following:

- The ability of new information and communication technologies to overcome space and time thereby transforming transportation and inventory management processes. Of particular importance are technologies such as global positioning, shipment/equipment identification, electronic data interchange, enterprise planning systems and decision support systems
- The world's movement into further deregulation of the transportation industry and harmonization of standards and rules, is creating opportunities to plan and move products based on economic considerations rather than bureaucratic dictates; the deregulation of transportation service in the US in the late 1970-s and early 1980-s, NAFTA, the European Union, Mercosur, ASEAN and open skies agreements, are all examples of continuing deregulation.² In addition, the privatization of national carriers and national infrastructure will continue to bring new players into the logistics arena.

The needs and the requirements on the one side and the myriad of opportunities on the other explain the growing importance and recognition of the logistics profession.

Yet, even as logistics is leaving such large foot prints on business and commerce, the question of "what is it?" has not been answered satisfactorily for many, in and out of the profession, since Henry Eccles (1954) posed it first . Furthermore, the continuous changes in the scope of what logistics professional do require that old definition be examined and updated.

Webster (1994)³ defines logistics as:

² An up-to-date review of deregulation histories in Europe and the US is offered in Aberle (1996).

³ A similar definition is given by Microsoft's Book Shelf 95, which is part of Microsoft's Office 95 suite.

- (1) The aspect of military science, dealing with the procurement, maintenance and transportation of military materiel, facilities and personnel*
- (2) The handling of the details of an operation. (From the Greek logistice -- the art of calculation)*

The Council of Logistics Management (CLM) defines logistics as:

The process of planning, implementing, and controlling, the efficient, cost effective flow of raw material, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customer requirements.

While rooted in military science, modern business logistics is seen by CLM and most logisticians⁴ as a business function, requiring a set of skills, and based on a developing academic discipline. As such it is developing its own set of analytical tools and a "philosophy."

Operational Logistics - Optimization of the "Three P-s".

The original and most elementary notion of logistics is that of a set of three operational activities - movement, storage and rearrangement⁵ - that add value to goods. The value-added inherent in these activities is based on the following:

Place - Adding place value to items by moving them from locations of lower value for the customer, to locations of higher value to the customer.

Period & Pace - Adding time value to items by storing them and thereby (i) moving items from periods when they are available (following extraction, harvest, or manufacturing) to periods when customers require them, and (ii) Making all processes more effective - inventory allows for de-coupling the processes along the value chain from each other, so they can each run at their optimal pace according to their own economics.

Pattern - Adding order value to items by arranging them in desired quantities and patterns. Example include consolidation, break-bulk, sequencing, picking/packing, etc.

⁴ See for example Novack et al (1992) and Johnson and Wood (1996).

⁵ In East Germany, where some areas of engineering and technology developed in isolation when the "iron curtain" was still up, the field paralleling Western business logistics has been called "TUL Technology." The acronym stands for "Transport," Umschlag" (for "break-bulk" operations) and "Lagerung" (for "warehousing"). See for example Krampe (1990).

The cost of adding place value is the transportation cost. The cost of adding the period value is the inventory carrying costs, and the cost of adding the pattern value is the cost of picking and packing, sorting, and sequencing. As items are moved through a distribution channel from a vendor to, say, a distributor, they go from the vendor's inventory, through a picking and packing operation, loading, transportation, receiving and are put away as part of the distributor's inventory management system. The same activities are then repeated when the distributor is replenishing the retailer.⁶

The transportation and storage operations have been long recognized as the building blocks of logistics. In many cases the creation of a "pattern" or ordering items according to certain rules, (which may include direction, size, sequence, ownership, or whatever) has been thought of as part of either the transportation or the inventory management function. Indeed, carriers have been sorting their freight as part of their consolidation operation and warehouse operators were placing items in storage in specific patterns and picking items and packing them into shipments as part of warehousing activities. Lately, however, logistics operators have been offering "ordering" or pattern-creation activities as a stand-alone value addition lines of business. Examples include line sequencing, where logistics companies would sequence parts and deliver them to an assembly plant in the order the items are needed at the plant, thus allowing the plant to synchronize the incoming flow with the production sequence. Another example is packaging, where logistics companies change the packaging of incoming items so they will fit better a downstream process.

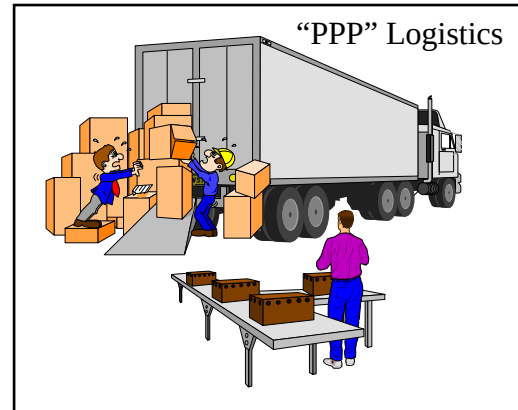
Another aspect of pattern-creation, or "arranging" is the processing of information. For example, after entering orders for certain goods, the software "rearranges" certain indices in the computer's data base so orders can be bunched and organized according to the distribution center that has to supply them, the plant responsible for manufacturing them, the carrier responsible for hauling them, the party responsible for payment, the time of shipment, or whatever. Thus, all the reporting associated with logistics can be seen as information pattern-creation.

Thus a definition of what *operational* logistics encompasses, can be based on the 3P's of logistics operations mentioned:

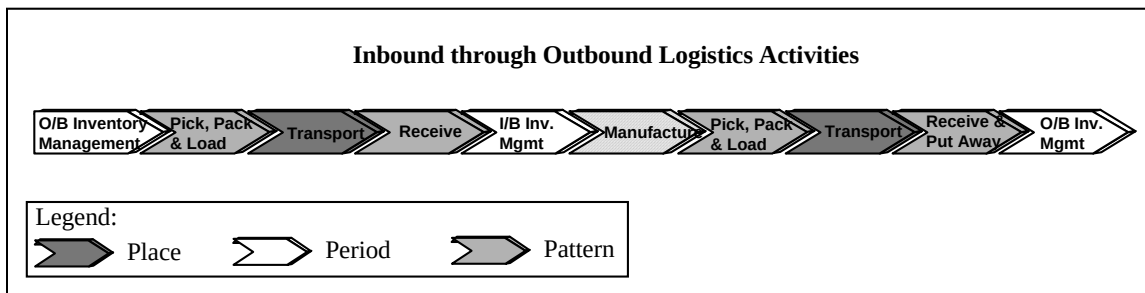
Logistics is the addition of place, period and pattern values to items.

⁶ Marshall (1920), in a book that was originally published in 1890, recognizes the three value-added function mentioned here, arguing that the "place utility" introduced by the transportation function is no less or more important than the "order utility" ("pattern" value addition in our terminology) introduced by the producer by rearranging matter in the manufacturing process. In our context, the pattern creation refers to activities conducted by the logistics function or logistics provider.

This definition is independent of what the "items" are so it may be applicable not only to inbound material and finished goods, but also to semi-finished goods, sub-assemblies and returns. Note that this definition does not mention explicitly the customers' requirement, since value is provided only if the movement, storage, or other activity conforms to those requirements.



The "PPP" notion of logistics, (or operational logistics) has been traditionally performed as a collection of functions: traffic, distribution, material management, inventory management, warehousing, and as part of manufacturing. The first stage in the evolution of logistics was to recognize this collection of activities and functions as part of a single profession, and the recognition of "integrated logistics."



This figure depicts the series of logistics activities associated with the three **P**-s of logistics. This series presents the activities from the point of view of a single player in the channel - a manufacturer. The leftmost outbound inventory management activity in the figure, however is typically conducted by the vendor of this manufacturer, managing its inventory of outbound goods, which are inbound material for the manufacturer under study.

Finally, operational logistics includes a set of specialty activities which support the primary "PPP" activities. These include audit and payment, customs brokerage, order processing, international documentation, etc.

Logistics as A Coordination Process - Two More "P-s."

Operational activities have been the cornerstone of logistics for many years. Soon after "business logistics" began to be established and recognized, it was realized that a focus on the improvement of transfer activities in isolation from each other was not sufficient. It became evident that most leverage for cost reductions and operational improvements was in the interfaces and interactions between activities. The integration and coordination

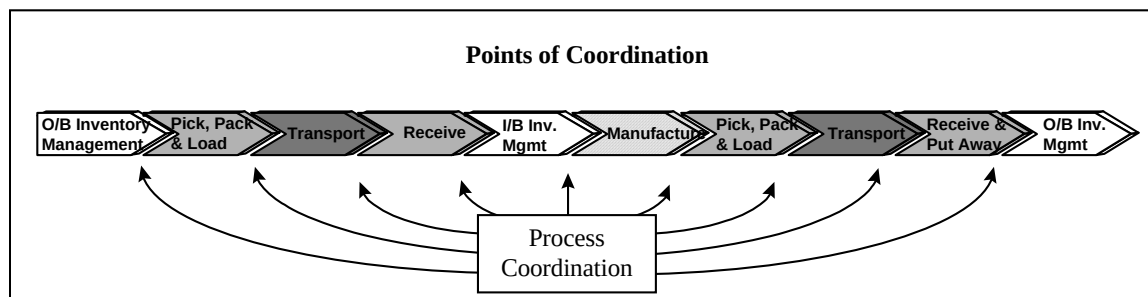
of such activities became a primary concern, foreshadowing what is now often called "supply chain management"⁷.

The supply chain management aspect of logistics can be defined as:

The coordination of the series of activities/processes which procure, produce, and deliver products and/or services to customers.

It is tied to the view of the enterprise as a collection of *processes* which need to be coordinated and integrated to ensure business success. Thus we introduce the fourth "P" of logistics: **process coordination**. The management of supply chains involves setting up many partnerships -- both inside the enterprise and between enterprises -- so this fourth P of logistics can also be referred to as **partnerships' management**.

The processes to be coordinated include not only the three P-s of "placing," "pacing" and "patterning." Instead they involve manufacturing and other operational activities.



Regardless of the type of flow (parts inbound or product outbound; primary or return, etc.) operational activities are always accompanied by information flows. The information consists of purchase orders, status (location and inventory) messages, invoices, shipment content information, period reports, etc. The management of these information flows is a crucial part of the coordination activities included in supply chain management. Not only does the information generated help execute the operational three P-s of logistics, but it has a value in its own right. It enables planning of logistics-related activities as well as control of all other corporate activities touched by logistics.

In addition to materials and information, there is also a need for the coordination of the flow of cash. The cash moves from customers to vendors, as payment for the items, and from vendor to customer to account for the reverse flow of items.

Last, leading corporations are also including logisticians in concurrent engineering teams. According to Volkswagen AG,⁸ for example, 75% of logistics costs are set by the

⁷ Lewis (1956) classical paper on "The Role of Air Freight" may be seen as a forerunner of this insight, which has been articulated more in Heskett (1963) and, recently through Weber (1992).

⁸ Private communication with Dr. Hermann Krog, head of Volkswagen's logistics organization.

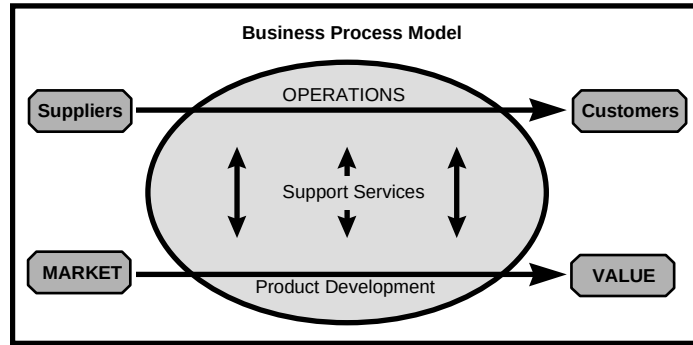
time "Job 1" (the first car of a given model) rolls off the assembly line. Thus, issues of design for logistics, plant location, choice of vendors and manufacturing discipline are all important determinants of logistics costs. Leading corporations, make sure, therefore that logistics considerations are accounted for at the earliest design stages and the process of designing the logistics supply chain is integrated with the product design process.

Supply chain management, as a coordination process is not a new concept. It has been taking root both within companies and in inter-companies operations, but has been known by different names. Within companies it has been known as "lean manufacturing," "re-engineering," "process orientation," "concurrent engineering," and even "team work." All these concepts are different manifestations of coordination of activities and processes along the internal enterprise's "operations" process, at different time frames. This process of managing the flow of items, from material and parts supplied by vendors to finished goods in the customer's hands, while coordinating with Manufacturing, Purchasing, Marketing, Finance, Legal and all other corporate functions is the essence of internal supply chain management.

Supply chain coordination activities among companies have also been described in many different contexts by various terms, all implying closer relationships and tighter coordination between the companies. These terms include the Japanese "Keiretsu," the practice of vendor-customer "partnerships;" the movements of corporations to "core supplier," leading to a reduction in the number of suppliers so coordination activities can be executed better; the practices of "vendor managed inventory," "efficient consumer response," "quick response," and "continuous replenishment" used in the consumer goods industry for tighter manufacturer-retailer coordination; the practice of "Just in time" replenishment used originally in the automobile industry and now an accepted practice of vendor-manufacturer coordination; and "pull" vs. "push" methods to move material along the supply chain.

Most of these terms and practices include elements of "coupling," "integration" and "coordination." To see the reason for it, note that aside from work-in-process, the only reason for having inventory is so that processes can be de-coupled from each other. The de-coupling allows each function to operate at its maximum efficiency in terms of its own parameters, including economic order quantities, process fluctuations, and process variability. All of the terms above are manifestations of the realization that not only is the inventory required in order to de-couple processes expensive and wasteful, but optimizing independently each function within the enterprise and each enterprise within the supply chain does not lead to over-all optimal processes. Many companies have demonstrated that quantum leaps in cost improvements and customer service can be achieved by integrating supply chain activities through coordination.

One can look at every enterprise as a collection of two fundamental processes: product development and "operations," or supply chain management.⁹ These two fundamental processes are supported by a range of support services such as Legal, Human Resources, Finance, Marketing, etc.



Embracing supply chain management is not "just another fad" for the logistics profession. Regardless of the type of process coordination activity which is relevant for particular enterprises, supply chain management is fundamentally a different activity for logistics professionals and it redefines the profession. It moves the logistician from a functional manager of one or more support activities to an owner of one of the two fundamental processes in every enterprise. In fact, recognizing the equal importance of activities that happen inside the factory walls and outside them, many organizations, such as Goodyear Tire and Rubber Company, Digital Equipment Corporation, and others, have an executive with the title of "Manufacturing and Logistics" in charge of that process.

Agility and the Last "P."

If one observes the activities of those businesses which appear to be the most advanced and successful practitioners of logistics¹⁰, it becomes apparent that beyond the function of "Placing," "pacing," and "patterning", and still beyond mere coordination among two adjacent activities or a customer-vendor partnership -- there is more. Companies as diverse as Toyota, Walmart, Dell, The Gap and many other, less visible, "champions" in today's dynamic and volatile markets,¹¹ seem to have found ways to set themselves apart in yet another way. They "program" their operations and processes to "mobilize" the flows of information and goods through their systems in a flexible and agile fashion. It is this agility, or **pliancy**, which is the fifth **P** of logistics.¹²

At the core of the success of the logistics leaders is the concept of "pliant flow"¹³, which leads them to:

- View their businesses as networks of interrelated flows that bring value to their customers, and hence focus on network structures and corporate cultures that allow

⁹ This view of commercial enterprises is taken from Lucas Engineering.

¹⁰ Rather than, for example, successes based on new product technologies, new manufacturing methods, utilization of information and communication technology, monopoly power, or charismatic leadership.

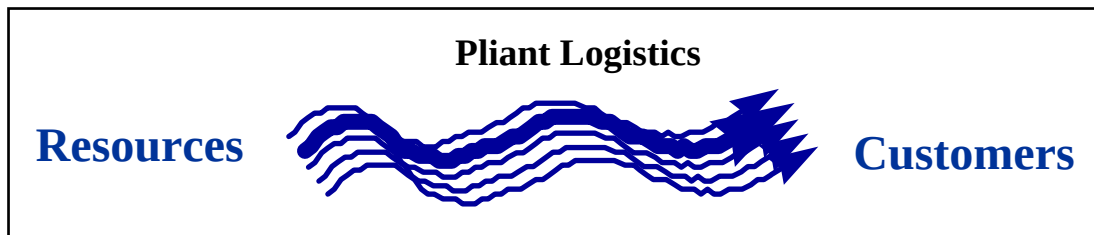
¹¹ See, for example, Simon (1996)

¹² The classical example for successful application of "pliant logistics" – even though the term is not used – is Toyota; see for example, Ohno (1988).

¹³ Some suggested phlexible phlow instead of "pliant flow..."

for - indeed demand - unobstructed, speedy flow of goods, information, cash, and ideas, which easily rise, ebb and change with customer demands.

- Focus on the *dynamics* of getting products, parts and information to move according the customers changing requirements, having the ability to adjust operations dynamically backwards, in an optimal fashion, throughout their own supply chain.
- Ensure that all parts of the business "oscillate together" in a holistic fashion by organizing resources and orienting people along the flows of the ordering, fulfillment and payment processes that are the lifeline of each business.



The primary flow in each business is, of course the supply chain, which entails the management of the "flow" of parts into manufacturing plants and finished products outbound to customers. It also includes the management of reverse flows rooted in returns, recycled items, exchanges, reusable containers, trade ins, etc. The flow perspective can be applied to work flows, cash flows, service flows, idea flows and elsewhere.

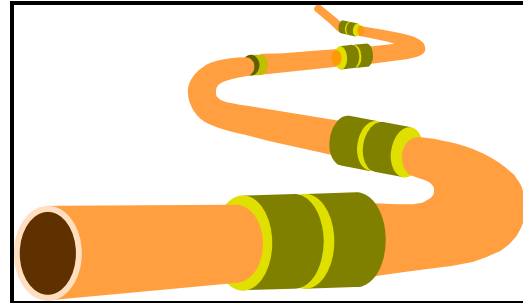
From the notion of pliant flow, one can develop a wealth of new ideas for the conceptualization and practice of management. Hydrodynamics concepts of characterizing flows, which can be transferred to the logistics context include, for example:

- Gradient - which, for any flow, is the force causing the movement. In logistics it is the service requirement. Parts/products flows are moved fast or slow depending on the customer service requirements and how well the control system "pumps" the flow.
- Velocity - the rate of flow, which for items in the supply chain is measures in inventory turns
- Viscosity - is an internal characteristic of the fluid moving. When we deal with the flow of items we deal with characteristics such as bulk, standardization, homogeneity, and inventory carrying costs, etc.¹⁴

¹⁴ Packaging is generally intended to improve those "viscosity" characteristics of the items flowing, to make the flow smoother and faster.

- Friction - measures the interaction of the fluid with its channel. With logistics flow we may be dealing with perishability, susceptibility to damage and pilferage, susceptibility to information loss en route, etc.
- Turbulent flow - characterizes the nature of the flow. Turbulent logistics flows involves rework, unscheduled returns, shortages and other unexpected phenomena. This contrasts with regular flow, where items, information, cash, and ideas flow smoothly.

These characteristics influence the speed of moving the items and the nature of the PPP logistics activities involved. Similarly, hydraulics concepts such as pressure, pumping and metering can be applied to the process of managing the flow along a supply chain.



While the analogy to fluid dynamics has its limitation, it can provide a strong guidance and a mental picture of what is required and how different items' flow can be compared and managed.

Pliant flow management requires efficient PPP (operational) logistics, and it requires that the right processes will be identified and controlled inside the firm and the right partnerships set along the supply chain. Beyond these prerequisites, however, the challenge facing logisticians is the development and management of smooth-flowing, demand-stimulated, well structured flows of parts and products. This requires a tuning of the organization by pruning non-value-creating activities, programming the directions and responses that ensure smooth flows, and setting up of the culture and ideas that will result in fast and agile organizations.

The two dimensions: operations and coordination can now be combined in the following definition of logistics management:

The dynamic management of flows of items, information, cash and ideas, based on coordination of all the supply chain processes and the addition of place, period and pattern values.

Summary of Framework

This paper suggest that one can think about logistics in two dimensions: the first one encompasses the basic three P-s of logistics consisting of providing place, period and pattern values. This dimension of logistics includes the provision of (i) transportation, (ii) warehousing and (iii) picking/ packing, sorting and sequencing.

The second dimension of logistics is the management of supply chains. This activity involves two aspects: (i) coordination of the processes controlling the flow of parts and products, from vendors to sub-assemblers, to manufacturers to distributors and finally to customers, and (ii) alignment of the flow of items, information, cash and ideas for maximum agility and flexibility.

Beyond the basic functions of logistics, is a specific perspective, which leads logisticians to view businesses and entire supply chains as networks, in which the changing flows bring value to customers. Such a perspective can bring about new opportunities for business rationalization

The five P-s of logistics are then:

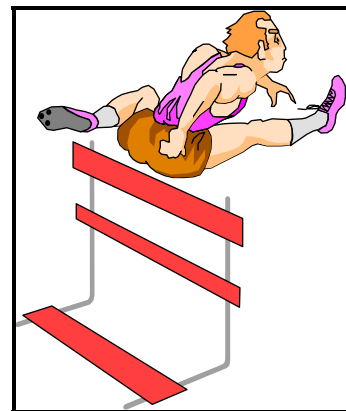
- **Operational Logistics:**
 - **P**lace value
 - **P**eriod and **p**ace values
 - **P**attern value
- **Coordination logistics:**
 - **P**rocess coordination and **p**artnerships
 - **P**liant flow management

The following table contrasts the two levels of logistics management. By its nature, the table presents these as two distinct management challenges, while in reality many logisticians are involved in activities that span elements of both operational and coordination logistics.

	Operational logistics	Coordination logistics
Focus of activities	Operational - improve efficiency and effectiveness	Strategic - improve competitiveness of the enterprise
Planning activities	Set systems, network and contracts to fulfill requirements	Choose the right partners; change organizational culture, set requirements
Customers	Other functions in the enterprise or other businesses	The end consumer
Place in the organization	A logistics function manager - one of the support activities	A process/flow owner - responsible for one of the two main processes of the enterprise
Optimization	Functional (i.e., vehicle routing, facility location, carrier choice)	Broad scope: enterprise and supply-chain wide; dynamic considerations
Orientation	Efficient transaction processing; reaction to the market	Partnerships and long term relationships; planing for continuous change
Performance metrics	Minimize functional costs, improve service to immediate customers	Market share, speed of product introduction

This table highlights the change in the logistics profession from the "PPP" operational view to the inclusion of coordination and flow management as part of the profession. The change from functional management to coordination means that the skills required by a modern logisticians are not restricted to the understanding of how to operate a warehouse or how to reduce the rate per mile charged on a particular lane.

A much more important set of skills is required and valued -- the skills that allow logisticians to "jump the barriers" of narrow functional thinking. Paramount among those is the ability to manage processes that cut thorough internal functional "silos" as well as create and maintain partnerships with vendors, customers, and logistics services providers, thus creating and managing extended enterprises. Furthermore, "static" management of such interfaces is not enough. These extended enterprises have to be agile and thus logisticians need to think in terms of dynamic solutions rather than rigid ones. In other words, logisticians should be equipped to set supply chains that not only respond to an existing situations but are able to change and adapt. The challenge then is to manage networks which are focused on creating customer value, by regulating the flow of items, information, cash, and ideas dynamically.¹⁵



¹⁵ A somewhat different thesis of the evolution of logistics, which, however, is based on the same set of considerations used here is offered by Klaus (1993).

Applying the Framework

Using the framework suggested here, it is now possible to classify logistics activities, thereby tackling some questions which many in and outside of the profession have grappled with for some time. The first of these is, of course, the question of what is logistics. An answer to this question was suggested in the definition given above and the discussion of the two primary dimensions of logistics. The framework can also be used to classify who is a logistics service provider, as opposed to a carrier with a revised title; provide a framework for thinking about what type of logistics services should be outsourced; and address the challenges associated with generating the human capital needed to address future logistics requirements.

Classification of Logistics Providers

One of the complaints voiced often by shippers and leading logistics services providers is that "everybody is now a logistics company." Indeed, the number of vendors identifying themselves as logistics providers has grown dramatically in the last ten years.

Traditional providers of operational logistics have focused their services on a single "P" or a single operational supporting service. Thus, transportation companies are in the business of providing place value - managing the movement of items (most of them using a single mode of transportation). Similarly, public warehouse operators, are in the business of providing period value - managing items while they are stored. Recently, logistics providers started to render "stand alone" pattern value services - providing value by organizing and ordering items, including consolidation, sequencing, kiting, packaging, etc. Similarly, logistics software houses provide data patterning services.

Furthermore, there are many providers of a single related, specialty service, involving the management of information, cash, or meeting regulations. Examples of such providers included audit and payment houses, order entry processors, customs brokers, international forwarders¹⁶, etc. These vendors provide a single auxiliary service surrounding the flow of parts and products.

What separates logistics providers from transportation carriers, warehouse operators, and other providers of a single service dimension is that they render more than one and sometimes all of the "PPP" logistics services, as well as a set of specialty services.

Modern integrated logistics providers, such as Ryder Integrated Logistics, Schneider Logistics, Caliber Logistics, CTI, Caterpillar Logistics Services, Menlo Logistics, and scores of others, offer all the three P-s of operational logistics. The provision of these services is typically characterized by reliance on primary assets such as transportation

¹⁶ Forwarding is, in many ways, all about coordination. Many shippers, however, look at it as a function, responsible for the "black art" of international shipping.

equipment, warehouses and other facilities, and including blue collar work force. Many vertically-integrated enterprises have, of course, provided all three values in house, using private fleets, company warehouses and their own manufacturing capacity.

Modern contract logistics providers have also started to offer coordination services, setting them further apart from traditional providers of a single service. These offerings are rooted in the provision of several operational logistics functions and the realization that by coordinating them the logistics provider can offer a "one stop shop" that services a large part of the customer's internal supply chain. The other motivation for offering coordination processes is that they render opportunities for the logistics providers to become part of the fabric of the customer organization, thus creating a stronger customer bond. Coordination services are sometimes offered independently by non-asset-owning providers, or in addition to providing operational logistics.

The most advanced providers are helping customers to see and realize the potential of transforming their businesses: from coordinated assemblies of functional competencies to integrated flow systems that maximize customer value and rationalize the network of contributing processes.

The "classical" providers of coordination and transformation services are the logistics management consulting firms. In the past, one would not have included consultants in any definition of coordination services providers even though that is the aspect of logistics where most of their advise is targeted. The reason was that most consultants did not use to provide such services but rather opinions and studies. The role of logistics management consultants is changing, however, as more and more of them are getting into the provision of services which include implementation.¹⁷ At the same time, traditional logistics providers are realizing that they have to provide "value-added" consulting services and so the lines between traditional types of providers continue to blur.

Thus one can define four types of logistics providers:

- Single value providers - including carriers, warehousemen, forwarders, customs brokers and other vendors offering a single dimension of PPP logistics value.
- Multiple value providers - who offer several PPP logistics services as well as cash and information management services
- Coordination providers - offering a set of coordination and flow management services which cut several function within the enterprise and between enterprises.

¹⁷ Note for example the recent strategic alliance between Ryder Integrated Logistics, Anderson Consulting and IBM, as well as the practice of running bid and core carrier programs by several management consultants such as A. T. Kearney and Mercer Management. Also note the recent emphasis on implementation in many consultants' advertisements..

- Strategic transformation providers - giving customers the vision and tools to redefine their businesses as flow systems and helping these customers instill this perspective in their organizations.

What Should be outsourced

Given the various types and levels of logistics providers and the trends towards focus on core competencies, an important question is how should one think about which services should be outsourced and which should stay within the enterprise.

Contracting out a single dimension of operational logistics value (a single "P" or single specialty service) is a relatively straightforward "make" versus "buy" decision. The traditional transportation, warehousing and specialty services industry has existed for a long time by selling services to shippers who chose to "buy." Furthermore, many shippers, even those running private fleets and company warehouses, have chosen to contract out such specialty services as freight bill audit and payment, customs brokerage, and forwarding.

Contracting out coordination services represents a large leap in a corporation's thinking about logistics. As long as only operational logistics is contracted out, providers can still be treated in a traditional adversarial manner, whether based on pure transactional relationships or contracts which are put up for extensive bids on an annual basis. It is, however, the contracting out of coordination services, which represents a true partnership, since the provider will have to coordinate with internal corporate organization beyond logistics.

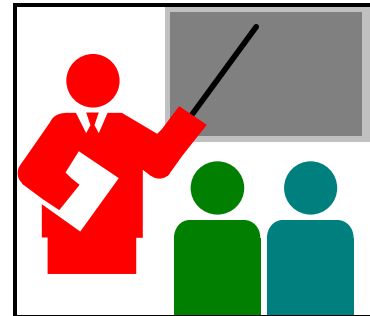
As mentioned above, however, forwarding services which represent pure coordination services are frequently contracted out. The reason is the coordination takes place between entities that many shippers do not normally deal with directly, such as ocean carriers, foreign drayage companies, or customs authorities.

Contracting out coordination and flow management services means that the logistics service provider coordinates directly with the shipper's manufacturing or marketing organization. For example, many automotive companies have contracted with CTI, Schneider Logistics, Ryder Integrated Logistics, and several others to provide inbound inventory deployment and transportation services. These include frequent downloading of "build" schedules and coordination of information between the shipper's manufacturing organization and the suppliers' data base systems. Similarly, companies such as Skyway, Menlo Logistics and others who are involved with consumer goods distribution, manage the information flows between manufacturers and retailers regarding promotion cycles, set up of in-store displays, manage returns and product recalls and coordinate other flows within their clients' organizations and between it and the customers and vendors dealing with it.

There is typically limited risks in contracting out basic "PPP" and related services. The risks increase when contracting out coordination services. These risks are twofold: first, a growing dependency on the provider of such services with subsequent high costs of changing providers, and second, the risk of losing expertise which are not easy to replace or develop. Coordination services require a higher degree of managerial talent than basic operational services and are also more situation-special, and therefore more difficult to find or cultivate in the short run. Yet, the reward from well-run coordination is much larger than the rewards associated with better managed functions.

Developing Logistics Skills: the Teaching Challenge

Logistics education and training in both academia industry have traditionally focused, just like the profession itself, on PPP logistics. Researchers have developed and taught methods and systems for transportation and inventory deployment issues. Thus, there are methods for optimizing facility location; inventory deployment and ordering rules; transportation routing and scheduling; and other operational challenges.



The profession has been less successful with the development of optimal coordination methods and tools, or developing the perspective of "flow management." Approaches such as material requirement planning (MRP) and distribution requirement planning (DRP), developed conceptually in the 1960-s, are recognized now as less than satisfactory, in that they promote "push" mentality, process de-coupling and long (and therefor relatively *inflexible*) supply chains. A new generation of methods based on lean manufacturing principles (Womack, 1990) and demand flow technology (Costanza, 1996) need to be developed so that the principles behind these methods can be codified and used en-mass. In that sense, the profession may need a new theory of "flexible flow management," which can then be used to develop methods and a general understanding

The challenge is also for universities to develop curriculums that teach methods beyond management science, which even with its enormous modern sophistication, can tackle only relatively simple, static questions. The future logistics professional need not only to be versed in the management of PPP services but in the management of extended supply chains, involving the building of relationships and the management of flows over far and wide networks. The issues facing this professional will increasingly involve the setting of strategic partnerships and the dynamic control of the flow of items and information throughout the networks connecting these partnerships.

What is Next?

This paper attempted to view the evolution of logistics in a new way. The 1997 Annual CLM Conference is dedicated to "breaking the barriers." This papers constitutes a

continuation of the effort to remove the barriers -- which are the narrowing functional perspective -- that have dominated logistics for a long time. This will, hopefully illuminate what advanced practitioners are doing and open our minds towards new ways to further the field in the future.

Like any other change and breaking of barriers, this is a risky undertaking. This paper is intended to continue the debate in the logistics community as to the role and education of future logistics professional.

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