

An Introduction to Logistics and the Supply Chain

Abstract

Oft times I have found that students come into a course¹ that assumes they have knowledge of logistics and the supply chain, but, in fact, lack that knowledge.

This note helps to provide a bridge to those students and improve their chances of successfully completing the course.

Applicable to the Following Courses

TMGT 7200 MIS in Transportation

TMGT 8510 System Design and Control

Introduction

Consider bottled water.²



Figure 1 Bottled Water

How did this bottled water get into your hand? To answer that we need to examine the fundamentals of transportation as part of logistics, and logistics as part of the supply chain.

This note aims to do just that at an appropriate level of detail so that you will be able to see the trees and the forest.³

You are the consumer and so we will begin with you and work backward (i.e., upstream) until we can effectively go no further.

¹ TMGT 8510 System Design and Control

² <http://news.moe.org.ir/images/docs/000003/n00003426-s.jpg> [July 22, 2009]

³ “To see the trees and the forest” comes from the idiom “can’t see the forest for the trees.” Also, can’t see the wood for the trees. Focus only on small details and fail to understand larger plans or principles, as in “Alex argues about petty cash and overlooks the budget”—he can’t see the forest for the trees. Answers.com, <http://www.answers.com/topic/can-t-see-the-forest-for-the-trees> [July 22, 2009]

In the Beginning

The bottled water did not suddenly materialize in your hand. You may have taken it out of your refrigerator, or from a vending machine, or from a corner store (as in this story), or any of several other places. That it is, it was stored. Storage in the context of logistics is most often associated with a warehouse or a distribution center. Here we have a distribution center we happen to call a corner store.

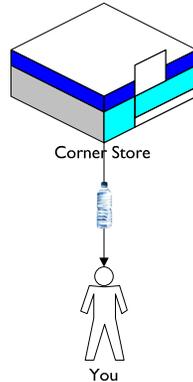


Figure 2 You and the Corner Store

We will be building a picture of the aspects of transportation, logistics, and the supply chain as we go along in this note. Figure 2 You and the Corner Store is where this story currently stands.

The obvious and fundamentally important question concerns the cause of the movement of the bottled water from the corner store to you. The cause is twofold.

First is the important notion that you had a demand for bottled water. The management and fulfillment of demand is one of the fundamental tenets of supply chain management.

Second, you had something of value to exchange with the store in return for the bottled water – money. You concluded that the bottled water was of more value to you than the price you had to pay. The corner store concluded that what you were willing to pay was of more value than keeping the bottled water on the shelf or in the cooler. The two of you made a deal. This notion of value and its exchange is also a fundamental tenet of supply chain management.

“Nothing happens until someone buys something.”⁴

We have an exchange of value – the bottled water and the selling price – that illustrate two of the fundamental themes that take place in transportation, logistics, and the supply chain; the movement of product and the movement of money.

How did you know to go to the corner store for the bottled water? Because you had information, another fundamental theme of transportation, logistics, and the supply chain (TLSC hereinafter).

⁴ Origin unknown.

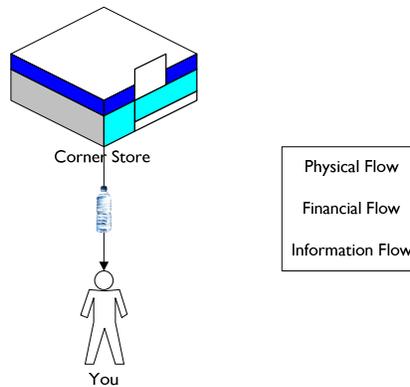


Figure 3 You, the Corner Store, and Themes

It might be helpful to place these themes alongside the first graphic.⁵

There are two other themes that emerge from this seemingly simple exchange.

The first comprises the roles and responsibilities of the corner store and you, the consumer. I associate roles and responsibilities with the human side of systems. In our story so far the corner store is the distributor of the bottled water and, if it wants to stay in business, is responsible for having the products its customers want at a price they are willing to pay. They are the seller of the product.

Your role is that of the buyer and your responsibility is to provide value in exchange for the bottled water, and to go to the store to pick up the product.

The final theme is that of processes.

The corner store can be considered to have, in the context of the story so far, two processes. The first is a process that distributes information to you letting you know it sells bottled water. The second is the process for managing the exchange of value.

You have three processes. The first is one that interprets and decides upon the offer made by the corner store. The second is the process whereby you get from where you are to the corner store. The third is the process for paying for the bottled water.

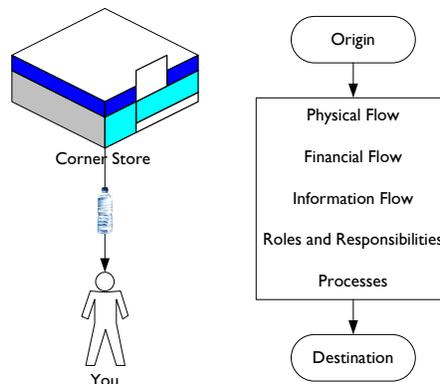


Figure 4 You, the Corner Store, and the Complete Themes

Thus, the physical abstraction (the left side of the graphic) and the mental model have equivalence. To make the mental model complete one adds an origin of the product (corner store) and destination for the product (you).

⁵ I tend to call graphics like these “mental models.” My experience has been that a reasonably small number of mental models can help one understand a great deal about how the world works. They are certainly easier to carry around than a suitcase full of textbooks and manuals.

I generally refer to the mental model as the channel stack. That is, it is the stack of things that must be considered when describing and understand how TLSC works.

We have also described a very simple TLSC network comprising two nodes and one link (Drogan 2007a).

This very simple example has allowed us to identify many of the key aspects of TLSC.

I contend that complex TLSC systems comprise many, sometimes very many, of these stacks coupled together.

Value, Price and Cost

The corner store stays in business and you buy bottled water because of the interrelationship between value, price, and cost.

Value is generally considered to be a measure of the usefulness or possession. Sometimes, as in the case of the corner store, it is an economic measure; the difference between the price to the consumer and the cost to the country store.

In other cases, artwork for example, the value is more intrinsic and expressed in statements such as “I bought the Picasso because I thought it beautiful.” This applies in the case of the bottled water. That is, you bought the water because it would quench your thirst and not because you were going to resell it.

Price is what the corner store charges for the bottled water and cost is what the corner store pays to sell the bottled water. You, as a consumer, only have a cost.

As long as the value to you of the bottled water is sufficiently larger than the cost to acquire it, and as long as the price the country store can charge you is sufficiently larger than its cost to sell the bottled water, a transaction that satisfies everyone can be made.

Value, price, and cost are useful, but in and of themselves are a bit abstract. We need to look at the next level down. Stock and Lambert provide a useful model, the logistics-marketing tradeoff model, for doing this (Stock and Lambert 2001).

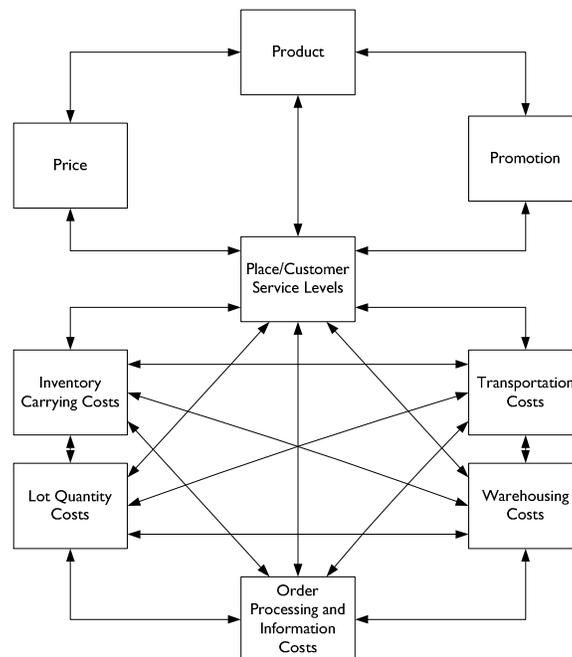


Figure 5 Logistics-Marketing Tradeoff Model

At the top are the 4Ps of marketing.

- Product refers to the set of utilities or characteristics a customer receives as the result of a purchase.
- Price is the amount of money a customer pays for a product or service.
- Promotion of a product or service encompasses both personal selling and advertising.
- Place is about having the right product and the right price where the customer expects it to be.

The bottom identifies the five fundamental logistics cost drivers that determine the cost of meeting customer requirements.

- Customer service is “Customer service is a series of activities designed to enhance the level of customer satisfaction – that is, the feeling that a product or service has met the customer expectation.” (Turabian 2002)

Level represents a measure of probability of meeting customer expectation.

- Inventory carrying costs are the costs required to acquire and maintain a desired level of I inventory.
- Transportation costs are associated with moving a product or service from one place to another.
- Lot quantity costs are those costs created by production and procurement activities.
- Warehousing costs are created by warehousing and storage activities.
- Order processing and information system costs are related to activities such as processing customer orders, distribution communications, and demand forecasting.

From your point of view you are interested in having the right product and the right price and in the right place so that you may make your purchase. These three items describe the customer service level that will satisfy your needs.

You are also faced with a transportation issue because you go to the store (the store does not come to you).

The cost to you of the bottled water is the sum of the cost to you of the product and the transportation to and from the corner store.⁶

In the context of our story, your logistics-marketing tradeoff model looks like this.

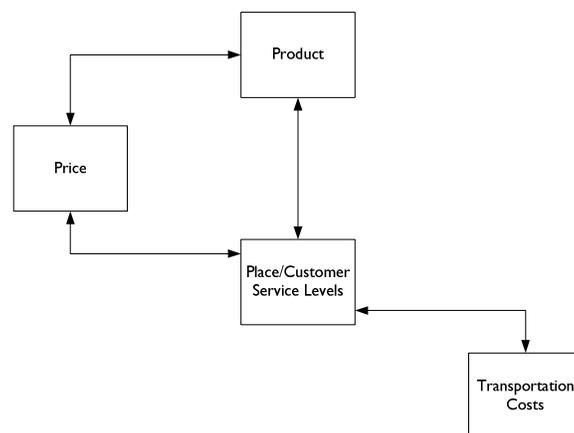


Figure 6 Your View of the Logistics-Marketing Tradeoff Model

⁶ Costs are just not out-of-pocket costs. There is also the value you assign to your time. Using your time to go to the corner store means that you don't use that time on something that may be of more value. Hence, in going to the corner store you incur an opportunity cost.

Your purchase decision arises out your assessment of these four factors.

The Rise of Complexity

Now consider the point of view of the corner store. It has many customers who have logistics-marketing tradeoff models particular to their own needs. The corner store needs to contend with multiple products, prices, and perhaps even promotion (i.e., sales) in an environment where competition may well be significant. In a way, the corner store needs to figure out which customer needs are critical to success then find the logistics cost structure that will best meet these needs.

The corner store is managing an environment where multiple customers and multiple suppliers of products come together to exchange value. Its aim is to make money by making as many of the customers and suppliers as possible happy.

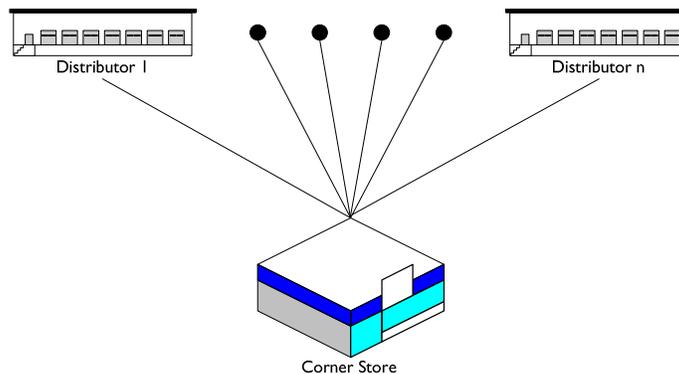


Figure 7 The Corner Store and Its Suppliers

The corner store has relationships with multiple distributors from whom it purchases products.

1. It is managing the logistics-marketing tradeoffs across all these relationships.
2. It is concerned about the channel stack across all these relationships.
3. It is a complex business.

The distributors in this picture (Stock and Lambert 2001, fig. 2-2) are often referred to as first tier suppliers.

These distributors are, of course, customers of other firms (e.g., manufacturers).

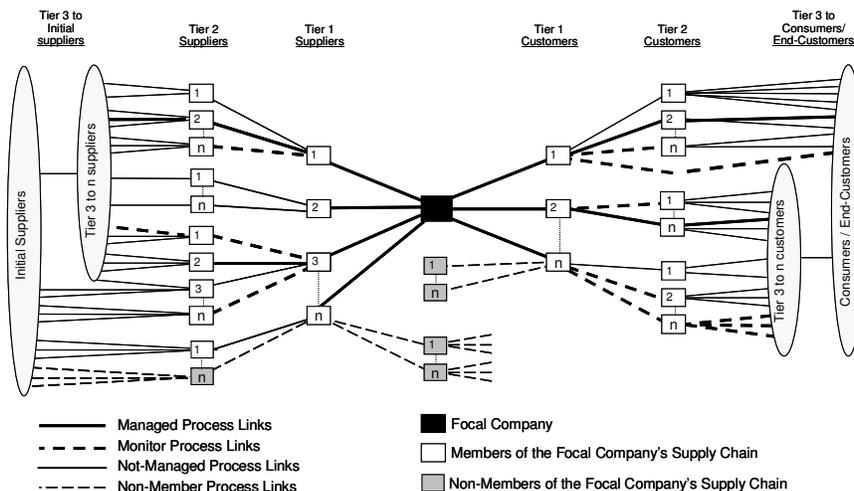


Figure 8 Supply Chain Network Structure

One can imagine then that the corner store, depending upon its mix of products, could have a number of distributors. That these distributors are, in turn, customers of bottlers of water, who are, in turn, customers of those who supply water, the plastic bottles and caps, and the labels that go on the bottles.

In sum,

“Logistics is the management of the flow of goods, information and other resources, including energy and people, between the point of origin and the point of consumption in order to meet the requirements of consumers (frequently, and originally, military organizations). Logistics involves the integration of information, transportation, inventory, warehousing, material-handling, and packaging, and occasionally security. Logistics is a channel of the supply chain which adds the value of time and place utility.”⁷

This is as good a working definition of logistics as any. By that I mean that what another means when the word “logistics” is used may not correspond with what you think the word means. The advice I would give you is to never make assumptions, but rather to ask three critical questions.

1. What does logistics start with? In our example it started with those who supply water, the plastic bottles and caps, and the labels that go on the bottles.
2. What does it end with? In this case it ended with you.
3. What does it include? We so far talked about the corner store, its suppliers, and their suppliers. We’ve identified themes (e.g., roles and responsibilities).

We’ve talked about you, the corner store, distributors, and suppliers. Each of these represents something tangible. And we have connected these tangible things with lines implying that these represented transportation. We talked about you and the corner store representing two nodes connected by a link. Nodes and links figure prominently in Figure 8 Supply Chain Network Structure.

Flows – information, product, financial – occur across these links. I want to take up the matter of product flow.

Transportation

“Transport or transportation is the movement of people and goods from one location to another. Transport is performed by various modes, such as air, rail, road, water, cable, pipeline and space. The field can be divided into infrastructure, vehicles, and operations.”⁸

While “Logistics is a channel of the supply chain which adds the value of time and place utility” as mentioned above, time and place utility are directly brought about through transportation.

Transportation spans geopolitical boundaries and introduces additional processes, roles and responsibilities into the complex system described above.

You are referred to Transportation Basics (Drogan 2007b) for additional detail.

Checkpoint

At this point we have covered two – transportation and logistics – of the three major points of this note. The supply chain remains.

My sense has always been that transportation is the base upon which the remainder of logistics sits. Let me illustrate that with the following small diagram.

⁷ Wikipedia, “Logistics,” <http://en.wikipedia.org/wiki/Logistics> [July 29, 2009]

⁸ Wikipedia, “Transport,” <http://en.wikipedia.org/wiki/Transportation> [July 29, 2009]

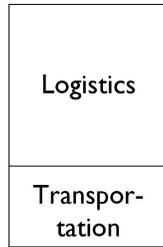


Figure 9 Transportation as a Base for Logistics⁹

Logistics demands movement and that movement is embodied in transportation. I intend to build upon Figure 9 Transportation as a Base for Logistics to complete a picture of the supply chain.

The Supply Chain

In 1985 Michael Porter of Harvard published his concept of the value chain (Porter 1985). He laid out the way in which firms create value through a series of fundamental and supportive activities. Here is Porter's original graphic.

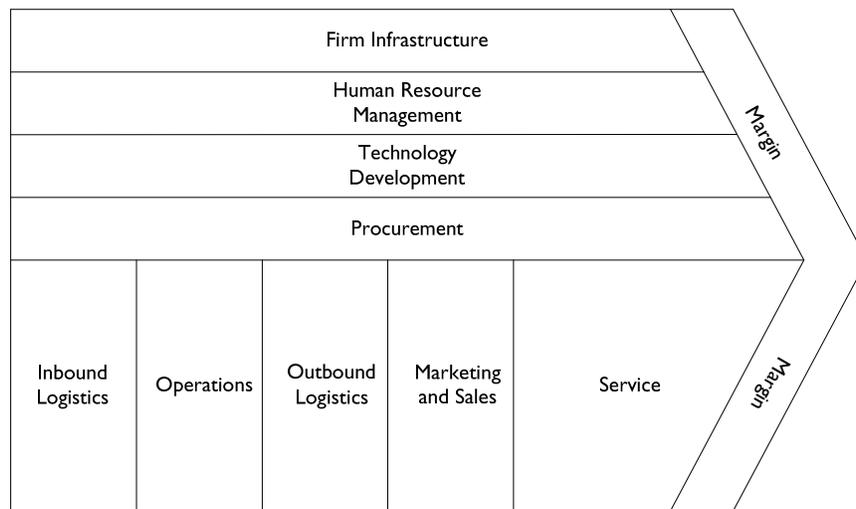


Figure 10 Porter's Value Chain

In essence, one moved material in to operations (e.g., manufacturing process) via inbound logistics, the finished product out using outbound logistics where it was sold in the marketplace by marketing and sales. Service can after the sale to support the customer use of the product. The difference between the cost of these processes and the price of the product constituted the margin. The layer in the top half of the arrow were activities shared amongst the value-adding processes in the bottom half.

I picked up on Porter's idea in 1997 and, over the years, have modified it to portray the world as I see it (Drogan 2009).

⁹ The Context of Interest

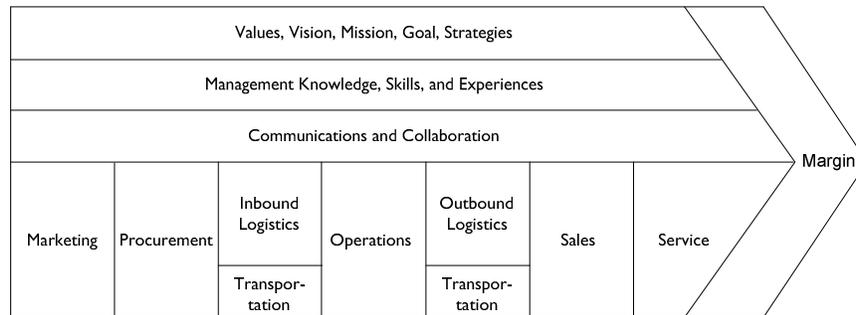


Figure 11 Drogan's Supply Chain

“A supply chain is the system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer.”¹⁰

Additional explanation of this structure follows.

Fundamental Activities

1. **Marketing** estimates how customer wants and need can be satisfied (the 4Ps) and the potential profit in serving the customers.
2. **Procurement** acquires the goods, equipment, and services required to produce the required products.
3. **Inbound Logistics** and its transportation component move the goods and equipment from their source to operations (e.g., manufacturing) in order to produce the final product.
4. **Operations** is the activity that transforms the inbound goods to the final product.
5. **Outbound Logistics** and its transportation component move the final product to the customer.
6. **Sales** assist the customer in matching their needs and wants to the products that offered.
7. **Service** is concerned with assisting the customer get maximum value after the sale has been concluded.

Supportive Activities

1. **Values, Vision, Mission, Goal, Strategies** set the configuration or structure of the organization (Drogan 2005; Drogan 2007c).
2. **Management Knowledge, Skills, and Experiences** guide the organization in the conduct of its business.
3. **Communications and Collaboration** represent the means whereby the organization coordinates its assets in order to achieve its goals.

Summary

Transportation, logistics, and the supply chain are ultimately about putting the right product in the right place and the right time and right price such that the customer prefers this service level and price to that provided by a competitor.

There are, of course, many factors (e.g., brand preference) that enter into a customer's decision for a particular product or service. The 4Ps are at the heart of the decision.

¹⁰ Wikipedia, “Supply chain,” http://en.wikipedia.org/wiki/Supply_chain [July 29, 2009]of

There is an extensive body of literature on the three major areas – transportation, logistics, supply chain – covered by this brief note. If your curiosity is aroused, and I hope it is, I urge you to follow these paths, a few of which have been suggested in this note.

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July 31, 2009

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