

Logistic: inventory and total logistics cost

[Business](#), [Management](#)



Supply chain is a network of logistic systems. Logistics concerns one company's system. Supply chain includes different companies. E. G. Dell computer - the logistics is just their company but the supply chain includes all the part suppliers. Their logistics system is a part of Dell's supply chain. It includes also the retailers and supplier. Other company's logistics included in Dell's supply chain. Logistics is an early version of the supply chain. Logistics originated in the US military. Flow of cargo (people, weapon in war is logistics.) Organizing a course/seminar - logistics needed for success.

Today all the successful companies find their competitiveness from logistics, not from the product itself. E. G. Wal-Mart (retailer, wholesaler, supermarket chain) - their competitive edge comes from logistics. They are not selling anything different from others. They have a superior logistics system.

Logistics make them succeed. Dell also, service is good, price attractive - success comes from logistics. Another definition people define logistics differently but they mean the same thing. Slide Logistics/Concept 4 Instead of saying process, they say optimization, etc. Process of location.

Says movement and storage of resources instead of saying goods/services and information. They call logistic activities economic activities. Transport is one of them, port services, production, storage, distribution, etc. - take place bet. The point of origin and point of destination and consumption. Logistics is about the 5 RSI. What are the 5 RSI? Logistics is about getting right goods at right place at right time in right form at right price. Military is really about this. In commercial entities we emphasize on the price a lot. This is also the definition of logistics.

Right goods, right in quality in correct quantity. Different level of logistics. In-bound, out-bound logistics. Logistics of production (table, book, car, etc.), there are two levels of logistics. Logistics within the production process - in the factory. How do you optimize the production within the factory? We call this operational logistics or workers together. How do you put temporary storage along the assembly line? All this is logistics. E. G. WHIM library - lack of space. How to maximize space? Library space layout. It's about logistics. Different factories have different layouts - this is logistics.

We are interested in logistics before the production starts. The cargo coming into the factory and when the production is finished, the cargo moving out to the next step - all towards the final consumption. This is what we call in-bound and out-bound logistics. This is what we are interested in. Maritime transport takes part in inbound and out-bound logistics than for production logistics. We are interested in how to move material to production and from production to consumers. When we try to understand logistics, we look at some logistics questions for example a typical question is about where to find the raw material needed.

Raw material may be in different places. Some places might have different quality and prices. The difference between that place and the production might be different and therefore remonstrations time and cost might be different. Where to find energy supply? Labor supply? Should you move your factory offshore to benefit cheap labor? If you do that be careful that higher prices might have to be paid on other services for example transportation. Where to set up production bases? In shipping, where should the port be

located? Where to build warehouse and distribution centre. E. . Toyota car has their distribution centre for the Nordic countries at the port of Mammal. Before that they had centre in all the countries. So many distribution centre, different logistics cost than if there is a concentration of activities. Where to have branch organizations? The answers consider a lot of activities including transportation. We are in maritime transport so we are affected by the customers decision. Other types of logistics questions for ex. How to transport from A to B and choice of transport mode - air sea, road. Egg. Oslo to Mammal - road, sea. Air, rail.

Different modes of transport have different logistics implications. Ex field trips - logistics question, how to transport students - sea (too long), air, road, rail. How to transport container? Hub and spoke - benefit from economies of scale. More cargo handling costs. The best solution must be a logistics solution. Best way to transport cargo from A to B. Flow and storage from point of origin to destination to comply with customers' requirement. Moving from A to B different options - different solution. When should transport start - how long should it take. Route? Storage? How, when needed?

Mat of cargo to be transported at one time? Economies of scale? Packing needed? Logistics is everywhere. Farmer from southern Sweden - buy fertilizer in Sweden, buy from Germany (expensive land transport), buy from US where its much cheaper, but he has to pay more transportation cost. Where to find the material? Emphasis is on maritime transport - movement of goods. Shipping co. Transport goods - need info to do so. Port and shipping concerned with flow and storage of goods. October 28, 2008

Session 2 Slide Logistics/Concept 9 There always has to be a logistics concept. And a logistics concept is what?

It's about total cost concept. This is the most important concept. It looks easy but total cost concept is not always observed, so people make mistakes as a result. It is a customer service requirement. Logistics concept is also about outsourcing, integration, global about concept, it is also about processes. The processes we call drivers. It drives the logistics process. It can't all be about concept. It has to be something tangible. Logistics is about processes. We are doing these everyday, ex. Manufacturing and transportation, distribution, inventory control, procurement.

These are all activities, but the difference between these and logistics are that we are doing these in an integrated manner under the concept of logistics. So we have the concept and the drivers. The difference between these activities and logistics, we are doing them under the total cost and the customer service concept, so this is relatively new. Third is IT. We call IT enablers - that enables us to do the processes under the concept of logistics. Sometimes we can't do the processes (drivers) without IT. Ex. Dell computers. They obtained their competitive edge from logistics.

Logistics means to get a computer from the production to the customers without any retailers. No middlemen. Order online, design own computer. The aim of logistics is to minimize the total cost. Can only do this with IT tools. So the three components have to come together using the IT tools. We need to understand the role of IT in the whole process. Ex. Just in Time system. This is Inventory control under the concept of egoistic using

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information technology. The 3 components have to work together. How do we take all these functions (MFC, transportation, distribution, warehousing, etc. In an integrated manner under the concept of logistics using IT tools. Ex. Individual delivery. Concept is to minimize total cost. Total cost is manufacturing, transport, dist. , etc. How do we minimize that? Use IT. Dell used IT to find out that their total cost will be minimized if they cut out the middle man. IT enables the cutting out of the middle man. Good online service. Shipping line is not making anything - it is a part of transport. Shipping companies as a company have logistics problems also. Shipping has a double role to play.

Shipping is a part of the logistics chain of a customer, but at the same time they have their own logistics problem. Shipping's logistics problems include arranging bunkers, choosing port of call, types of service to provide, empty container management, repositioning of containers, terminal logistics, fleet logistics, agency logistics, but shipping as a service provider is part of the logistics of customers. Ex. KEA - furniture maker - shipping important.

Shipping has a double role to play. Ex. Wimp's logistics service. Logistics in third world countries is not good enough. Read World Bank Report.

The three components of logistics are important. Dell manages their total cost through logistics, so does Wall-Mart. All the processes have to be IT enabled. Control-implementation-control. HP has a fixed model on the shelf. Dell, make your own - different customer service. One is enabled by IT. Logistics has 3 components - concept, process, IT. Slide logistics/Concept 10 Supply chain - different sources to choose from. Take one then the next step

and the next. This is the flow of cargo from origin to destination - the flow of information from user to origin. Information flow and cargo flow go in opposite directions.

Ex. Dell - the information goes from the customer to Dell and the cargo from Dell to the customer. How will the producer know what kind of products the consumer will need? The consumer will have to tell. Opposite directions. Dell transport one computer to each customer so the customer pays more for transportation, but other costs like the shops and overhead related costs do not exist. If we compare this cost with the cost is very important. Total cost concept can be better understood by looking at slide Logistics/Concept 1 1 . This is a Total cost in Logistics and Supply Chain System.

Marketing and logistics are closely related. This picture is very true. What is marketing? It is about the 4 As - product, price, promotion, place. So in this marketing there is one component about place which is about logistics. In the logistics about the place and the customer service (where the customer wants the cargo to be) and there are other cost elements. Ex. Related to place, transport cost has to be incurred - also warehousing cost, flow and storage. Other costs like inventory costs will be incurred. What is the difference between inventory cost and warehousing cost - inventory cost for keeping goods in stock).

Inventory cost is the value of the goods. Books for new WHIM students - cost of book (inventory) plus storage (warehousing). Processing and information cost - each time we order, we have to follow procedure, fill in forms, etc. Processing cost can be high. Egg. When we are transporting our boxes home,

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have to have bill of lading. This has a cost (processing and information cost). Lot quantity cost - economies of scale. Purchasing/transporting/buying a big amount and will benefit from economies of scale, this is called lot quantities. Put all these 5 elements together and this is total cost.

The objective of logistics is not to optimize a cost element, it's not to minimize a cost element, but rather to optimize the total cost and minimize the total cost. Minimize the total cost - this is what logistics is all about. This is easier said than done. KIT, the idea is to reduce the inventory cost to zero if possible. At the same time warehousing cost is being reduced - this is a good system. What other cost will be affected - transport cost. All these cost elements are interrelated and interdependent. So interaction and interdependence are also important.

Change of inventory will affect transport cost, lot quantity cost, etc. KIT system for example - daily consumption of rice. Let's say we eat egg of rice each time. Based on KIT, each time we need rice, we should buy only egg. Do we do this? No, then against KIT principle. We buy 200 kilos - 2 cost occur - inventory cost and the money spent on the rice cannot be used (capital tied up - cash flow problem). If this money was put in the bank it would generate some interest. Where is the rice put? The place occupied by the rice can't be used for something else.

In production if you buy too much to get economies of scale from purchasing, we'll incur a high inventory cost. If we are not buying kilos, we buy a quantity in between - say 2 kilo. Optimal total cost. If we buy egg each time inventory cost is zero - have to buy each time we need to cost. That is

time and transport cost. Lot quantity cost will change as there is no savings to be got through economies of scale. And each time we buy there are other costs like information and processing (maybe not in the case of rice, but generally). Put all these costs together, and find a good place in between. We do this by Cost Trade-off.

Cost Trade Off Slide Ex. Manufacturing activity involves making projectors in Mammal, Sweden and need to supply them to the rest of Europe. No distribution centre, or warehouses, or depots, o because we cover the entire Europe, each time we have an order from someplace in Europe, we pack the projector and send it off. What do we save - inventory, we do not keep inventory. What do we have to spend more - transportation cost will be very expensive. We therefore have to find out if we have a warehouse somewhere in them from Mammal to the customer; we send it from that storage which is closer so we save transportation cost.

How many such warehouses we need to cover Europe? It depends on the elements: transport, inventory, lot quantity, warehouse costs. In optimizing all these costs together is a logistics decision. Ex. In the case of the depots, we might have 8, 10, 12 to cover the entire Europe. What cost elements we have in the case of the distribution of projectors in Europe. First the systems cost, the processing and information cost. When there is a centre there needs to be a computer system, a financial system, etc. If there is no centre, the system cost is very low.

The more centre, the higher the system cost and this is a storage cost. If there is only one storage at the headquarters in Mammal, the cost would be

relatively low. As the numbers of depots are being increased the storage cost will be very high. Inventory cost - more depots, more stock - higher inventory cost. Trucking cost - tree has trunk and branches. Trunk means main transportation, branches mean local delivery. Transport cargo from production to main distribution centre = trunk transport and then from distribution centre to each individual apartments = local delivery.

Trucking cost - the more centre, the more trucking cost. If there are no depots, each time to ship from mammal to each individual location will be very high. The more depots, the less the local delivery cost will be. The total distribution cost is the addition of all cost, this is what we call total logistics cost. When we have the total logistics cost curve it corresponds to the number 8 meaning there should be eight distribution centre. So this is the solution - 8 centre. As costs change, oil, etc, the optimal numbers of centre will change. Its not static, its dynamic (the Total Didst. Curve).

Logistics - one has to plan, implement, control. If the individual costs are changed then total cost will be different - high/low. E. G. If the interest becomes low - inventory cost will be affected as the capital will become cheap. If oil cost increase, interest rate decrease - could end up with more centre which means saving more rainspout cost, esp.. Local delivery cost. Transport cost in total will be less. Inventory cost is dependent on interest rates. May have 9/10 depots. # of depots depend on cost elements. Cost trade off is important. With depots total cost is lower, so this will save cost.

Having depot is a cost but the cost is lower than not to have them. E. G. KEA used to rent warehouses, now they build - benefit of depreciation. Next Slide

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Logistics cost in the USA Logistics cost include transportation cost, inventory, warehousing, distributing, etc. How much logistics cost people pay as a percentage of a country GAP - 10% in the US. Inventory cost increase faster than the transportation cost bet. 1980 and 2005- why? Better inventory control, interest rate lower so inventory cost lower. Interest was low in the rest of the world until about 2005. Deflation = lower inventory cost.

In other countries this percentage is much higher. China - 18% of GAP spent on logistics (used to be 20%). China is more representative of developing countries. So in developing countries logistics systems are not as efficient as those in industrialized countries. 9. 5% is similar in Europe and Japan (COED countries). In developing countries it's much higher. Includes all logistics cost element - transport, inventory, etc. - big room for improvement. Next slide Customer service is another concept. Customer service is the output of logistic based, performance-based, philosophybased.

Activity based e. G. After sales service, marketing, public relations.

Performance based - what is the standard? Ex. Dell computer is performance based, delivered in 48 hours - performance-based customer service. Can be measured. Ex. , ports - waiting time for ships - rush. Philosophy based on what customers require is the customer service - according to customers taste - before, during, and after transaction. What is transaction? Buy goods, pay. Customer service can take place before this, during, after. Changes in CSS level affect total logistics cost. Next slide CSS High, Low.

Cost Low/High - the higher the customer service level, the higher the cost.

No ship should wait in port for more than 3 hours. This will cost a lot of

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money - will have to build more berths. Define customer service level. Try to minimize total cost based on this pre-condition. Why CSS level increase and inventory level affected. The higher the CSS, the higher the inventory level. Goal: increased SSL, so high inventory level. It's a decision the company makes - customer service level is very important. (Refers to graph on the right) Try to find a way to push the line by introducing a better way of production e. . Using IT, new production method. Reduce cost but still satisfy goal - IT, use better system. Next slide: industry norm, etc. Customer's response to stock out. Is a risk being run of losing the customer? All different ways to define the customer service level. KIT System Developed by Toyota. Called the Kanata system. When a container of parts is chosen to be used from inbound stock in-out in-out This is the production. Eng the assembly line how do you get different stages to work together in harmony. The system has two cards. KIT works with 2 cards - the move cards and the production cards. When you see the move card, time to move the container or the other card, time to produce. Work centre 1 the card moves along the production line from one work centre to the next. Toyota manage to have minimum inventory along the assembly line. They have one container of part. Cards are turning around and the parts are being moved from one centre to another. For logistics a better understanding of Just in time is very important. 9 Oct 2008 There are two circulations of cards. How do the 2 circulations make the KIT system work? Why does it work? Key elements: to reduce inventory therefore reduces the capital tied up in inventory.

Planning, staff commitment including suppliers, suppliers' ability to meet the demand. Some inventory is kept because there is a container. One piece at a

time is being used from the container so the rest must be inventory. What is the average inventory? What is the customer requirement? It's the size of the container. The container is full - how big is the container. How is the size of the container defined? The size of the container is planned based on production. Supply 20 units at the beginning and then it's consumed and a new container comes. The container is consumed during a cycle. The cycle is the time needed.

The average inventory is a half of the container whatever the amount it contains. Typical KIT, there should be no inventory so why is inventory kept? When we need egg rice why don't we get exactly that? Other costs would increase too much. KIT - to keep as little inventory as possible. The size of the container depends on what? Transportation two don't match then the size of the container needs to be changed. If the transport takes more time then increase the size of the container and vice versa. Transport time important. Volvo had KIT between Gent and Mammal. How much inventory should be in the Volvo factory in inventory?

A lot. Why? Engine parts are made in Sweden to be used in Belgium. This transport takes one week by ship. As it takes one week, there should at least be spare parts for one week. Toyota has KIT. In the city of Toyota in Japan within 30 kilometers of the factory all Toyota parts are made there. This is the perfect KIT system. KIT emphasizes the reliability of the transport system. The two containers must have the same matching size. If parts can't be produced in time, the cart must be moved earlier. At the moment one

container is taken to the in stock point, another container load of part should be produced.

Suppose the production takes more time than when one cart comes back? Egg. If production takes 20 hours, parts can be made in 10 hrs. The time information is sent - information flow is the key. Plan to know how long production will take. In Japan, transport is guaranteed (Toyota). What is supplier commitment? Shortcomings of the KIT system? Now we assume we only need 20 parts in 10 hours, how about if the demand change and we need 30 parts in 10 hours. If the speed of production is variable the whole system is challenged. If the demand is certain/flexed then it can be planned - production rate and transportation.

But what if production rate changes? This is a challenge for some of the production down the line that may need more time and material which might have to come from far. Not easy to adjust production. Shortcomings: Does only one supplier have to be used with KIT? No, Honda uses more than one supplier. In KIT, anything that goes wrong will collapse the entire system. In KIT the entire chain has to be KIT, it can't be at only one stage of the production. If not it forces other suppliers down the line to keep inventory. KIT of big companies push inventory down the line if they don't plan effectively.

Because smaller suppliers want to satisfy big companies, they are forced to keep inventory. KIT has to be along the entire supply chain. KIT may be only at the very large suppliers who push the inventory down the line to smaller suppliers. Toyota case: 1/52 weeks car production stopped because of a fire

at one supplier - ripple effect. The decision of Toyota to do nothing was based on the total minimum cost of they did various studies. CCITT Case: The reliability of transportation and the uncertainty factors make logistics system key. The importance of information. Logistics concept drivers enablers, under total cost and customer level.

KIT will never work without IT. Everything works together with IT supporting the processes under total cost and customer level. The process, concept or IT cannot work separately. Information is critical for success as well as the reliability of demand. Forecast and planning important to know when demand change. Transportation is also important for this system. If the transport distance is long, the container has to be big. The size of the container is influenced by time (transport). Transport is via sea - only use air in case of emergency. If transport takes a long time or is unreliable then more inventory needs to be kept.

Gent is the biggest Volvo manufacturer. Terrines transport the parts from Sweden to Belgium. The shorter the interval of the shipping service, the lower the level of inventory required. This can make the transport expensive. So it's the total cost that is important that will Supply chain 2 definitions (see slide): it's a network, not port to port. In logistics there is no procurement. The 2 key words in logistics are flow and storage. Supply chain includes manufacture. Transformation = manufacturing. 1st law of dynamics - don't create anything, only change the form. Supply chain includes much more than logistics.

Logistics narrowly defined. Supply chain is broader. Procurement also concerned with about origin of the goods. Optimization Integration Collaboration Synchronization Optimization - optimize one stage, the entire thing is not optimized so integration has to take place then consolidation then synchronization (concerted manner, happening in the same time). Relationship along supply chain. Start from optimization to synchronization. The idea of supply chain is relatively recent compared to logistics. 1960/ass people start to talk about total cost. E. G. In stage one warehousing and transport are separate functions.

Management focus was operations performance. No integration. Logistics integrated both to see how they can be optimized. This is called total cost management. So the focus changed to optimizing total cost and customer service. Customer service put together with cost. Organization design is a centralized function. 80, s integrated logistics function. This moved today to supply chain MGM. Put logistics together to get supply chain. Supply chain broader than logistics. Stage 1 -separately treated, not optimized.

Optimization done within the company. Optimize internal functions - transportation and inventory.

Intra company and intra functional. This function is a logistics function. The logistics function today is moving still in the company but inter functional. Everything in the company put together - integration. Toyota inter company - higher level of integration. Toyota owns the supplier - easier to do KIT. Companies are integrated supply chain - Inter company and inter functional. Dell and their suppliers are integrated. Also Wall-Mart. The producers don't

take orders from Wall-Mart - the 'cards' in KIT comes from individual supermarkets. Producers can check storage level of Wall-Mart outlets.

Everything is totally integrated. No personal intervention to place order etc.

The system is integrated - good supply chain - inter company. Next Slide

From fragmented logistics to integrated supply chain. In the first stage do one function at a time - inventory or warehouse or transport. In the later stage, intra functional - the whole function optimized. From fragmented logistics to integrated SCM. Suppliers, manufacturer, distributor, retailer, customer are all integrated with the other functions in the company and go to the next stage you integrate between the functions in the companies and between the companies.

This is interception and will become in the true sense a supply chain. Supply chain broader today than the logistics. SC have to work with other companies. To satisfy your customers require more than one company: need supplier, manufacturer, distributor, and retailer. E. G. Markers - their system integrated with some of their key customers - key client management.

Copra's definition of supply chain. Within an organization there is a supply chain. Eg. WHOM, teaching, supply services, library, canteen, etc. All depots. Work together to satisfy customer. SC decisions - have to have supply chain design and strategy.

Strategic level, medium term, short term - operational, daily and based on the company's competitive strategy. Michael porter: define competitive strategy in terms of product differentiation or cost cutting leadership. How to achieve strategy: SC strategy. Balance bet. Efficiency and responsiveness.

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How to respond to demand? Efficiency includes cost-effectiveness, I. E. Cheap. Fast response - this is provided at a cost. Efficiency might compromise cost. Decision making is from lower level to higher. Many competitive strategies come from SC strategy. Wall-Mart is from logistics.

Dell is from Supply chain Beer game: Once demand is variable SC difficult to maintain. KIT difficult to maintain. Long time to reach an equilibrium. In the end have to keep large inventory. Once demand is unstable KIT is not suitable. SC Design. Planning is important. SC design is about planning. When suppliers design their supply chain maritime and port services is a part of that. So mapping is important. Stockholders point is storage. Horizontal line represents move. When it stops - vertical lines = storage or waiting. Egg. BBC container tracking. This is SC mapping.

Horizontal line is lead-time (time from production centre 1 to production centre 2). Lead time depends on inventory to determine when order is to be placed. SC starts from the fiber and end with the clothes on the shelf.

Through this we see pipeline length and volume. E. G, coca cola.

Postponement of safety stock What is postponement? H and Ezra - they use postponement principle. Clothes must be in fashion. Don't know faction of 09. Try to postpone as much as possible the manufacturing time. Forecast, ii, postpone. Dell also uses this strategy. Don't develop their machines until last moment.

Can use the latest technology and the price gets cheaper. Anticipate time needed and kind of product needed. Decision is postponed to the last moment. Postponement principle can reduce stock. Has bearing on transport

too. Better information flow will impact SC. Next slide Sometimes for material flow speed might not be appreciated. Transport is used as storage to adjust transport time to match with performance. Sometimes it's because of the price. E. G. Iron ore in China, there is too much now. Information speed is always good but for material sometimes it needs to be fast and other times not so fast.

Compression of lead-time in manufacturing activity. Supply chain map - length (vertical) volume (horizontal) - try to compress it to see possibilities to reduce some of the variable. Ocean transport can't be adjusted as speed can't be reduced. SC design. Lead-time is transport. Port of Amsterdam case studysummary Market research - likelihood to attract new carriers / guarantee - balance and supply (elasticity). When port built no congestion in Europe - more port than ships. Impossible to get firm commitment - plenty choices. More supply than demand. Demand price inelastic. Shipping companies never give guarantees.

Optimization, integration, collaboration, synchronization. Have to synchronize. Increase speed of one operations but the speed of other things remained unchanged. No synchronization. If the discharged boxes cannot be moved this is a logistics problem. The concept of logistics: most important - total cost. Port of Amsterdam forgot total cost. Typical failure case that should never have been done. Restricted berths - bigger ships cannot fit in today - size is restrictive. How wide and long should ship be. (Panama Canal has size restriction and is thus a constraint - ships in the Asian