Course Name	**: Transport & Logistics Management**
Course Code	**: APBSS 502**
Course Level	**: Level 5**
Credit Units	**: 4 CU**
Contact Hours	**: 60 Hrs**

Course Description
The Course explores all dimensions on Logistic Management, Inventory management, packaging & labeling, having a sustainable transport, transportation demand management, sustainable fleet management.

Course Objectives

- To equip students with adequate knowledge about logistics management.
- To facilitate student to have a better analysis of the role of inventory management in a business organization.
- To enable students have clear explanations of the key logistics management functions and processes.

Course Content
Introduction
Logistics

- Origins and definition of Logistics
- Logistic Management
- Forms of logistics
- Returns Management system

Inventory

- Meaning of inventory
- Inventory Management
- Reasons for keeping stock
- Special terms used in dealing with inventory
- Typology of inventory
- Principle of inventory proportionality
- Accounting for inventory
- Role of accounting inventory

Manufacturing

- Meaning of manufacturing
- History and development of manufacturing
- Economics of manufacturing
- Manufacturing and investment around the world

Warehousing

- Definition of warehouse

- Nature of goods stored
- Processes and Information Technology
- Major warehousing processes

Packaging and Labeling

- Meaning of Packaging
- Purposes of packaging and package labels
- Symbols used on packages and labels
- Packages development and considerations general types of packaging machines.

Sustainable Transport

- Meaning of sustainable transport
- History of sustainable transport
- Transport and social sustainability
- Sustainable transport policies and governance

Transportation demand Management

- Meaning of TDM
- Arguments in favor of TDM
- Transportation Demand Management measures
- Transportation management system
- Processes of transportation management
- Functions of a Transport Management System (TMS)

Sustainable fleet Management

- Definition of Sustainable fleet Management
- Aims of sustainable fleet management
- Elements of SFM

Assessment
Coursework 40%
Exams 60%

TRANSPORT AND LOGISTICS MANAGEMENT

Overview

No other area of business operations involves the complexity or spans the geography of logistics. All around the globe, 24 hours of every day, seven days a week during 52 weeks in a year, logistics is concerned with getting products and services where they are needed at the precise time.

It is difficult to visualize/realize any accomplishment of marketing, manufacturing or international trade without logistics.

All organizations need more materials, to manufacture, build factories that collect raw materials from suppliers and deliver finished goods to consumers. Retail shops have regular deliveries from wholesalers to new stations. For people in towns and cities, they eat food brought in from different places. For any time you buy, rent or hire or borrow anything at all, someone has to make sure that all the parts are brought together and delivered at your door.

Logistics is the function responsible for this movement. It is responsible for the transit and storage of materials from their journey between suppliers and customers. The food we eat, the clothes we wear, the machines we use, the beds where we sleep come from far away. If there was no ability to distribute them, humanity would be in total dangers. Almost everything we have in our homes, organizations comes from different places and logistics is what makes it possible to buy these things /items at a measurable price.

Throughout the history of mankind, wars have been won and lost through logistics strength and capabilities or the lack of them. However, while military generals and field marshals from the earliest times have understood the importance of logistics, it is strange to observe that business organizations have come to recognize the vital impact that logistics management can have on their competitive advantage.

In 1962, Peter Drucker, one of the recognized management genius observed that logistics was the most neglected most promising that some chief executives have a limited view of logistics, Drucker says that business goes through a series of evolutionary steps beginning with production moving to finance and marketing and the last step in the evolution is the need to solve distribution or logistics problems.

Aims of Logistics Management

To move materials move, through and out of the organization as efficiently as possible.

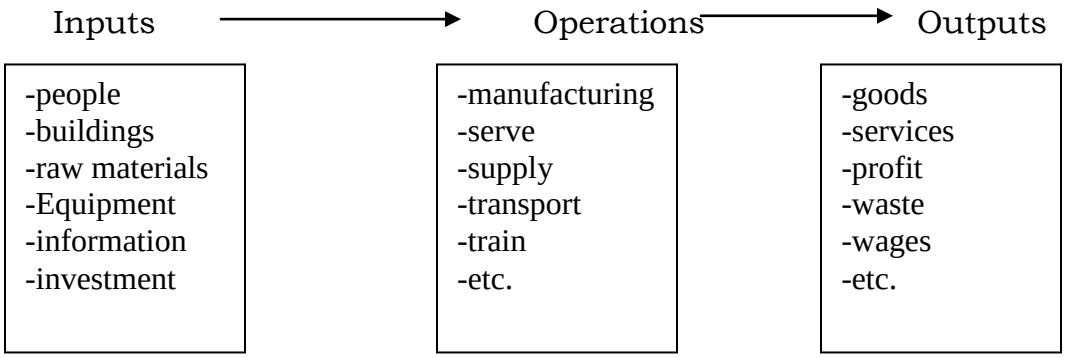
To contribute to an efficient flow through the whole supply chain.

The overall aim of logistics supply chain is satisfaction. This is achieved through the provision of :

- the right product.
- Delivered at the right place.
- In the right quantities.
- At the right place.
- At the right time.

The Scope of Logistics.

The basic nature of business is that process sing or buying something whether foods or information changes. Its form in someway which adds value and sells a product or service to someone else. At the heart of every organization are the operations that create and deliver the products. These operations take a variety of inputs and convert them into desired outputs. The inputs come from people just as the outputs go to some other organizations or people. This relationship is depicted as follows:



NB:

- Moving materials into organizations from suppliers is referred to as in-bound or in-ward logistics.
- Moving materials and to customers is referred to as outward or out-bound logistics.
- Moving materials within the organization is referred to as materials management.
- Materials are all items that an organization needs and moves to create its products. These materials can be both tangible and intangible.

In summary, the scope of logistics covers:

1. In-bound logistics – concerned with raw materials and refined materials.
2. Core business – concerned with process or refine and manufacture.
3. Out-bound logistics – concerned with supplying to others and components or sub-assemblies.
4. Reverse logistics – concerned with the broad processes of returns management.

Definitions of Logistics Management

Logistics is the function responsible for the flow of materials from suppliers into an organization through operations with in the organization and then outside to the customers. It is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services and related information through the point of origin to the point of consumption in order to meet the customer requirements. (Council of Logistics Management).

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Logistics is the process of managing the movement and storage of goods and materials from their source to the point of ultimate consumption (Institute of Logistics (IL) UK).

In short companies depend on their logistics systems to move goods and materials among the supply chain partners.

Business activities covered by Logistics

- Transportation
- Warehousing
- Material handling
- Packaging
- Inventory management

- Logistics information systems.

Activities included in logistics.

(i) **Procurement/Purchasing:** The flow of materials through an organization is usually initiated when procurement sends a purchase order to the supplier. This means that procurement finds suitable suppliers, negotiates terms and conditions, organizes delivery, arranges insurance and payment and does everything needed to get materials into the organization.

(ii) **(ii) In-ward Transport /traffic:** This actually moves materials from suppliers to the organizations receiving area. This has to chose the type of transport (road, air, water, rail, etc.), finds the best transport operator, designs a route, makes sure that all safely and legal requirements are met, get deliveries on time and at a reasonable cost.

(iii) **Receiving:** This makes sure that materials delivered correspond with the order, acknowledges receipts, unloads delivery vehicles, inspects materials for damage and assorts them.

(iv) **Warehousing/stores**: This moves materials into storage and takes care of them until they are needed. Many materials need special care such as frozen food, drugs, alcohol, in bond chemicals that emit fumes, animals and dangerous goods as well as making sure that materials can be delivered quickly when needed. Warehousing also makes sure that materials have the right conditions, treatment and packaging to keep them in good conditions.

(v) **Stock Control**: This sets the policies for inventory. It considers the materials to store, overall investment, customer service, stock levels, order sizes etc.

(vi) **Order picking:** This finds and removes materials from stores, typically materials for a customer are located, identified, checked, removed from racks, consolidated into a single load, wrapped and moved to a departure area for loading onto delivery vehicles.

(vii) **Materials handling**: This moves materials through the operations within an organization. It moves materials from one operation to the next and also moves materials picked from stores to the point where they are needed. The aim of materials handling is to give efficient movements with short journey using appropriate equipment – with little damage and using special packaging and handling where needed.

(viii) **Out-ward Transport:** This takes materials from the departure area and delivers them to customers and this has concerns that are similar to in-ward transport.

(ix) **Physical Distribution Management:** This is a general term for the activities that deliver finished goods to customers including outward transport. It is often aligned with marketing and forms an important link with down stream activities.

(x) **Recycling, Returns and Waste disposal**: Even when products have been delivered to customers, the work of logistics may not be finished materials. Perhaps they were faulty, or too many were delivered or they were simply the wrong type and in all the three cases, they have to be corrected and brought back. Sometimes, there are associated materials which are returned to suppliers for re-use. Some materials are not re-used but are brought back for recycling and finally there are those materials that cannot be used again but are brought back for safe disposal e.g. dangerous chemicals. Broadly activities that return materials are called reverse logistics or reverse distribution.

(xi) **Location:** Some of the logistic activities can be done in different locations. Stocks of finished goods for instance can be held at the end of production, moved to near-by warehouses, put into stores nearer to customers, past on to be managed by other organizations or a range of alternatives. Logistics has to find the best location for these activities or at least play a significant role in the decisions. It also considers relate questions about the size and number of facilities.

(xii) **Communication:** Alongside the physical flow of material is the associated flow of information. This links all parts of the supply chain, passing information about products, customer demand, materials to be moved, timing, stock levels etc. coordinating the flow of information can be very difficult.

In summary, depending on circumstances, many other activities can be included in logistics. Sometimes an organization might include:

- Sales forecasting
- Production scheduling
- Customer service management.

What is essential is that all activities must recognize that they have one primary objective i.e. getting an efficient flow of materials.

The Principles of Logistics Excellence

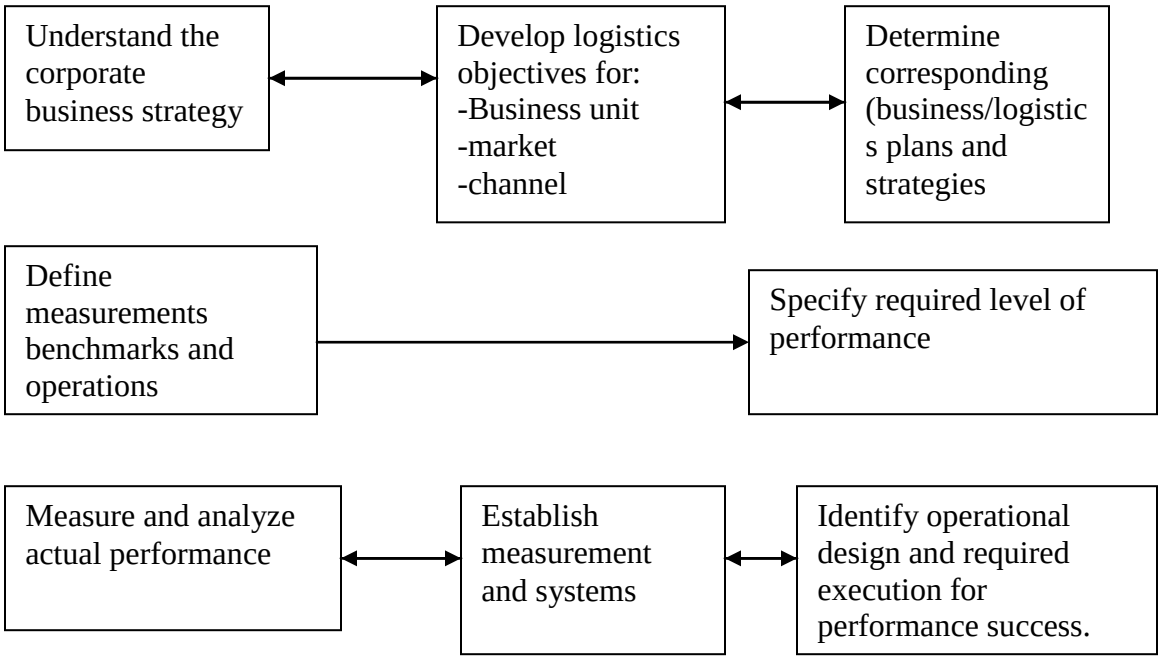
Logistics has been a neglected function in many organizations but of recent, its contribution has received wide recognition.
Recognizing the role of logistics in profitable companies helps one to appreciate and understand how the function fits into the overall scheme of business. However, it is essential for one to gain understanding of the reasons that can make logistics operations successful irrespective of industry, company type or geographical location.

Alling and Tyndall conducted research that focused on senior logistics executive who were known for improving corporate profits through logistic

decisions and their findings revealed the following principles of logistic excellence.

(i) Link Logistics to Corporate Strategy:

This means that all aspects of logistics operations mist be directly linked to the corporate plan.
This principle can be illustrated on the framework for strategy focused operations as follows:



The above framework provides for a process that allows a linkage step (forward and backward) causing logistics operations to be driven by and contributes to the corporate strategy.

(ii) **Organize Comprehensively.** Organizing as a management function is basically concerned with establishing a structure and assigning roles and responsibilities within the structure so as to control all corporate logistics functions under a single business unit.

(iii) **Take full use of information:** Successful logistics departments take full advantage of information and information process technology. For example using Electronic Data Intercharge (EDI) to link customers, creative use of computer models so as to yield cost-services improvements, competitive differentiation and increased market share.

(iv) **Emphasize human resources:** Achieving logistics excellence demands a deliberate strategy of enlightened human resources management. Logistics excellence flourishes in an environment that re4cognises people as the most important asset of an organization or department. Recruitment, education, training and job enrichment are standard practices to achieving this. Management should acknowledge individuals for productivity gains and in some cases incentive programmes to foster excellence within the logistics function through enlightened human resources should be encouraged. Logistics professionals should be highly trained in a number of multi-disciplinary fields which fit within the changing environments.

(v) **Form Strategic Alliances:** Logistics excellence calls for companies to form closer partnership with other participants in the supply chain or specific product chain or channel. Because of competition, many business communities have realized that successful closed partnership and strategic alliances can help organizations exploit their competitive potentials while responding to the global challenges of competition. The relationships or alliances are no-longer short term or arms-length but they should be long term in nature. However, achieving these strategic alliances is not an easy task, they cannot succeed without open and timely exchange of information. Companies need to share financial and operational data as well as forecasting planning and scheduling information.

(vi) **Focus on financial Performance:** Functions such as transportation, warehousing and customer services should be managed as cost centers or profit centers. In principle 1, i.e. linking logistics strategy to corporate strategy is one element of logistics excellence; however, it cannot be achieved without proper financial management of logistics functions. This is because knowing the financial consequences of logistics activities is essential for forward planning. To re-emphasize this close linkage, many organizations to lead their logistics operations.

(vii) **Target Optimum Service Levels:** Companies that target optimum service levels improve their profitability. To do this effectively, companies should quantify the incremental revenue gained from providing excellent customer services and measure it against the costs that are involved in establishing a customer services strategy. This involves understanding the customer demands and putting in place mechanisms of fulfilling such demands and expectations.

(viii) **Manage the detail:** Streamlining operations and procedures is important to profitability but attention to details can mean real savings. Companies should have their fundamental issues under control and constantly resolve seemingly minor issues or problems collectively because these solutions add up to the smooth performance of the logistics organization.

(ix) **Leveraging Logistics Volumes:** This principle specifies that successful logistics operations consolidate shipment volumes, inventories etc. To gain operating and financial leverage. This is because these consolidations pay off in terms of improved customer services and cost performance. This should be done after management analyzing opportunities against the costs.

(x) **Measure and react to performance**: This advocates that after achieving logistics excellence, it must be sustained if not the gains will be short-lived, companies must therefore measure their logistics performance and react to the changes in a dynamic fashion.

(xi) **Factors for Improvement in Logistics:** Despite the obvious importance of logistics, it has not always received its fair share of attention. Historically, organizations put all their emphasis into making products and little attention was given to the associated movement of materials. Some managers did recognize that transport and storage were needed but they were viewed as technical issues that were not worth much attention. The trend has however changed due to increasing pressures to improve logistics as well as potential savings- many other factors are encouraging organizations to improve the management of their supply chain. They include the following:

- **Increased Knowledge of customers:** With globalization, customers are much more knowledgeable due to accessible information through the use of the computer and internet and they now demand better quality goods and services at lower costs and want them only yesterday i.e. at the right time.
- **Competition:** The rate of competition in business organizations is now much stiffer than was the case before. Because of this competition and numerous changes, organizations must look at every opportunity to remain competitive. Logistics and its management has been identified as having a potential if managed well to make organizations more competitive.
- **Changes in the supply chain:** There is a change in the supply chain. Very large retail chains demand customized logistics from their suppliers. Other changes in retail markets include the growth of 24 hour opening, home deliveries, telephone and online shopping etc.
- **Growth of International trade**: With the emergence of the borderless world or the global village, International trade has continued to grow among countries. With IT, there are logistics best practices which are expected among trading organizations. This has forced all those organizations involved to improve their logistics. For instance, JIT; time compression, mass customization, flexible manufacturing etc.

- **Change in focus by some organization:** Some organizations are turning from a product focus where they concentrate on the end products to a process focus where concentration is on the way the products are made. This encourages improvements in operations including logistics.
- **Growth of outsourcing**: Organizations are outsourcing peripheral/non-core activities and concentrating on their core operations. Logistics is a useful area for third party operators with specialized companies offering a range of services.
- **Increased co-operation:** Organizations are increasing co-operation through alliances, partnerships and other arrangements. This integration is important for logistics which is usually the main link to the organization and the supply chain.

Key Trends in Logistics Management

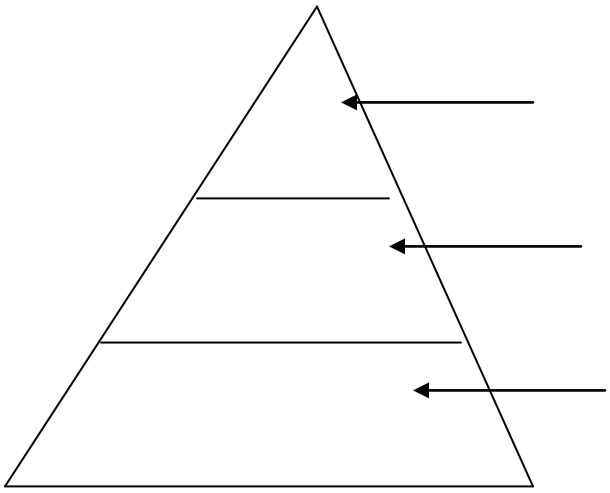
The following are some of the key trends that are influencing the logistics management functions in organizations.

- **Globalization:** Companies now compete for world markets and are no longer satisfied with local markets. As managers expand their search for best value, they cast their nets in even wide patterns and arte rewarded with attractive sources in non traditional locations. Logistics managers must transport those materials to global manufacturing locations and then to world wide customers achieving time, place and availability goals.
- **Supply Chain Integration:** The traditional focus of customers has been expanded and logistics have to be internally and externally integrated. This has been facilitated through the use of collaborative initiatives.
- **Reduced number of supplies.** In the past, organizations used to have a large number of suppliers. This encouraged competition ensured that they got the best deal and maintained secure deliveries if one supplier ran into difficulties. The current trend however is to reduce the number of suppliers and develop long term relationship with the best so as to maintain and secure delivery at a lower cost.
- **Flexibility and Speed**: These are important areas where competitive organizations are expected to show a high degree of excellence. The best supply chains are ultimately the best responsive. These organizations are able to recover from unexpected changes in demand and supply. Internal processes of leading companies are both integrated and focused on their customers' need for flexibility and speed.
- **Track and trade capabilities:** Supply chain exceptions occur unexpectedly and logistics managers must modify operations to correct them. This requires constant monitoring and adjustment, usually leading logistics companies and their suppliers provide online information on shipment status and real time.

- Collaborative logistics: Leading companies are employing similar approaches assuming transportation and facility. They believe that with combined capacity, they can meet changing needs and reduce their acquisition costs. This may mean sharing information, logistics resources and cost reduction strategies.
- **Reverse Logistics:** Logistics managers must now plan the reverse flow of their products from the consumer to the disposal area with the same care as their distribution. This has been because of the gree movement which has caused companies to re-think product design and logistics to minimize their impact on their environment.
- Growth of third party logistics providers and outsourcing: There is a growing trend to outsource many of the logistics functions to third party providers who have specialized knowledge and skill.

Designing and Implementing a Logistic Strategy:

Organizations make decisions at various levels. Generally, there are three major levels at which decisions in an organization can be made. These can be illustrated below:



(i) Strategic decisions: These are the most important and they set the overall direction of the organization. They have effects over the long term. They involve many resources and are the most risky.

(ii) Tactical decisions: These are concerned with implementing the strategy over the medium terms. They may look at more details involve fewer resources and some risks.

(iii) Operational decisions: These are the most detailed and concern activities over the short term. They involve few resources and little risks. In case of misfiring or any mistake, the effect felt is negligible.

The traditional view has senior managers making strategic decisions and then set the organizations on its course. The strategic decisions give the objectives, constraints and context for the tactical decisions made by middle managers. There in turn give the objectives, constraints and context of the operational decisions made by junior managers.
This is still usually the approach of making decisions but the style of managers and improved technology has encouraged changes. The current development is to see even conversionary rigid organizations such as the armed forces have their decisions discussed, negotiated and agreed upon rather than merely passing them down.

Strategic decisions are of various types and people use different names for these but the most common ones are:

- Mission : - This is a statement to give the overall aim of t h organization.
- Corporate Strategy: - This describes the strategic direction of each function including logistics.

Essentially, the higher strategies set the goals and general direction of the organization while the functional strategies show how it is to be done.

Logistics Strategy:

A logistics strategy ensures that an organization's logistics choice like "transport, warehousing, information system" etc are consistent with its overall business strategy and support the performance dimensions that target customers value most like outsourcing a firm's logistics.

Definition: A logistics strategy can also be defined as all the long term decisions about logistics. The logistics strategy of an organization consists of all the strategic decisions, policies, plans and culture relating to the management of the supply chain. It forms a link between the more abstract higher strategies and the detailed operations of the supply chain.

Focus of the Logistics Strategy:

In practice a logistics strategy is most likely to emphasize the following elements:

(i) **Cost:** Most organizations want low costs but some go ahead to adopt a positive strategy of minimizing their logistics costs. This leads to higher profits for the organizations and lower prices for the customers.

(ii) Customer Services: Logistics control stock levels, delivery times speed of responses and other measures of customer services. By concentrating the logistics strategy on customer services, organizations can get a long term competitive advantage.

(iii) Timing: Customers generally want products as soon as possible so a common logistics strategy guarantees a shorter time to market.

(iv) Quality: Customers always demand for high quality products. A common logistics strategy guarantees high quality services.

(v) Product Flexibility: This is the ability of an organization to customize its products to individual specifications of customers.

(vi) Production flexibility: Changing levels of business can cause severe problems to logistics. Therefore, production flexibility allows an organization to respond quickly to changing levels of demand.

(vii) Technology: Logistics uses a wide range of technology in communication, tracking movements etc some organizations have designed logistics strategies using t he latest technology.

Logistics strategy Options

Each organization designs its own logistics strategy but they often move along similar lines. Micro Porter suggested that there are two basic strategies that an organization can adopt namely:

- Cost Leadership strategy: This strategy involves an organization makes the same products or comparable products of the same or similar type. In this case an organization will be competitive because it charges lower prices than its competitors. And in the context of logistics, this implies charging lower prices for logistics functions.
- Differentiation strategy: This strategy involves an organization making products that customers cannot get from other suppliers. It is only that organization which offers the products and not any other.

Other logistics Strategies can include:

(i) Lean Strategies

The aims of a lean strategy are to do every operation using less of each resources i.e. the people, space, equipment, time, finance etc. It organizes the efficient flow of material to eliminate waste, give the shortest load time minimize stocks and total costs.

Early work on lean operations was done in the Motor Induastry led by TOYOTA. This work concentrated on lean production but the methods got such good results that they spread into other areas eventually developing a lean enterprise. The approach is summarized in five main principles.

- Value - Designing a product that has value from a customer's perspective.
- Value Stream: - designing the best process to make the product.
- Value flow: - Managing the flow of materials through the supply chain.
- Pull: - Only making products when there is customer demand.
- Aim of perfection: - looking for continuous improvements to get closer to the aim of perfect operations.

Robert Townsend says that all organizations are at least 50% waste i.e. easte people, waste effort. Waste space, and waste time. During their development work, TOYOTA identified the following areas of the supply chain where this waste is most likely to occur.

Quality: Too poor to satisfy customers either internal or external.
Wrong Production level or capacity: Making products or having capacity that is not currently needed.
Poor processes: Having unnecessary, too complicated or time consuming operations.
Waiting: For operations to start, finish, for materials to arrive, equipment to be repaired.
Movement: With products making unnecessary, long or inconvenient movements during operations and then removes those that add no value, eliminates delays, simplifies movement reduces complexity, uses high technology to increase efficiency, looks for economies of scale, locates near customers to save on travel ad removes unnecessary links in the supply chain – these could be middlemen or agents.

(ii) Agile Strategy

This concentrates on the other side of the "efficient –V-responsive" or Lean-V-Agile debate. Its supporters argue that Lean operations put to much emphasis on the cost and cannot deal with change in conditions, increase in competition or more sophiscated and demanding customers.
The aim of an agile strategy is to give a high customer service by responding quickly to different or changing circumstances.

Types of Agility:

Speed of reaction – This is where organizations keep a close check on customer demands and react quickly to changes.
Ability to tailor logistics to demands from individual customers.

(iii) Strategic alliance:

This is where an organization puts much emphasis on co-operation with other parts of the supply chain. The purpose here is to get efficient supply chain. The purpose here is to get efficient supply chains with all members working together and sharing the benefits of long term co-operation.

(iv) **Time based strategies**:

These aim for a guaranteed factor delivered product.

(v) Diversification Strategies.

These aim at dealing in a range of products and services to capture all the interests of different customers.

Designing a Logistics Strategy:

The starting point for designing a logistics strategy is examining the higher strategy and seeing how logistics can contribute to it. Then organizations can summarize the results in a logistics mission. The logistics mission gives a simple statement of the aims of supply chain management.
An example of a mission statement can be;

Our mission in logistics is to contribute to the corporate aim by mixing materials needed for production into the company, moving work in progress through the company and moving finished products to customers.

We aim to give a flexible, reliable and cost effective service that completely satisfies our customers both internal and external.

A logistics mission is useful for setting a scene and helps in showing the overall direction as well as setting priorities for the organization. It is also advisable to carry out an environmental scanning where a SWOT analysis i.e. strengths, weaknesses, opportunities and threats is necessary.

An Illustration of a logistics strategy:

From the diagram below, it can be seen that logistics strategies are designed while considering three major issues namely:

- The higher strategy
- The organizations competitive edge /advantage.
- The business environment.

(i) **Higher Strategy**: This sets the organization's goal and the context for all logistics scenes. The mission sets the overall aims and the corporate and business strategies show hoe these aims will be achieved. The logistics strategy must support these higher strategies. For example if the business strategy calls for higher customers services, the logistics strategy must show how the logistics function will achieve this.

(ii) **The business environment;** this consists of factors that affect logistics but on which one has no control, over such factors are usually in the external environment. They include:

- Customers i.e. their expectation, altitudes, and demographics.
- Market conditions i.e. size, location and stability.
- Technology i.e. current availability, likely developments and rate of innovations.
- Competitors i.e. their strengths, ease of entry into the market etc.
- Legal constraints e.g. trade restrictions, liability and employment laws.
- Interest groups i.e. their objectives, strengths, amount of support etc.

(iii) Organizational competitive advantage.

All competing organizations work in a similar business environment. Each can only work in a similar business environment. Each can only succeed if it has a distinctive competence that is under control of the organization.

A distinctive competence stems from an organization' assets which include:

- Customers: their demand, loyalty and relationship.
- Finance i.e. capital, debt and cash flow
- Employees i.e. their skills, expertise and loyalty
- Technology – currently used, parts and special types.
- Products – unique with special features different from those of the competitors.
- Facilities – Improved and in a good condition.
- Processes – Very fast processes which do not take a lot of time to be started or completed.

While designing a logistics strategy, organization should could critically the above three factors, Organizations should consider the business environment in which they operate as well as their competences after comparing with their competitors.

Developing a logistic strategy:

Different authors have recommended different stages involved in developing a logistics strategy.
Movich has identified four steps for designing a logistics strategy. They include.

- Understanding and measuring customer needs.
- Finding the weaknesses of carrying logistics
- Bench marking
- Simplifying the whole logistics system

The most systematic approach with SWOT analysis and has the following steps.

1. Do a logistics audit (external audit)

The external audit gives an analysis of the business environment in which logistics works. It shows the factors that lead to success in this environment and the importance of each of the factors.

2. Do an internal audit.

This involves analyzing higher strategies from a logistics vies point giving the context and overall aims of logistics . its strategies, focus and perhaps include a logistics mission.

3. Design the general features of the supply chain:

These features should be those that best deliver a desired service. This includes the designing of network, location of facilities, capacity, technology used etc.

4. Set Specific goals:

These should be set in such a way that they show what each logistics activity must achieve. –the internal audit shows how well the current logistics achieve these goals and identifies areas which need improvements.

5. Design the best organizational structure control and systems to support the logistic network.
6. Benchmark the logistics:

   This can be done by looking at the performance with planned, optimal and competitors' performance.

7. Implement the Strategy:

This should be done while setting the conditions for lower level of logistics decisions.

8. Monitor actual performance.

Continually look for improvement to keep the strategies up to date and give feed back.

CUSTOMER SERVICE AND LOGISTICS MANAGEMENT:

Introduction:

The essential purpose of distribution and logistics is to provide services to customers. Thus this provision is essential and key to efficient distribution of logistics management. A customer should at the end of the day not be unhappy with the services he/she is getting because for example orders are not complete, the wrong goods have been sent to him/her, deliveries have been made to the wrong address or they are late, special instructions have not been complied with goods are damaged on arrival, the driver is not courteous or the vehicle in which the goods arrived is not what the customer expects.

The most number of companies consider customer services to be an important aspect of their business. When pressed however, there are many companies that find it extremely difficult to describe exactly what they mean by customer service or provide a precise definition of a customer service measures.
Traditionally services provision have been based on very broad assumptions of what customers want rather than taxing into account the real requirements of customers or at least customers perception of what they require.

Meaning of Customers Service:

In the context of logistics and distribution management, customer services is concerned with making the product available to the customer. It can also be looked at in the sense that there is no value in the product/service until it's in the hands of the customer. However, "availability" in itself is a complex concept which is impacted on t by many factors. These might include:

- Delivery frequency and reliability
- Stock levels and order cycle time.

Ultimately, customer services are determined by the interaction of all those factors that affect the process of making products and services available to the buyer.

Aspects of Customer services:

There are many aspects of customer services but the most important ones include the following.

(i) Order Cycle Time: How long does it take to deliver the product to the customer from the time the order is received.
(ii) Consistency and reliability: Is the delivery on time every time.
(iii) Inventory availability: Is the product ordered available from stock.
(iv) Order size Constraints: Is there a minimum quality of value on the order.
(v) Ordering convenience: How easy is it for the customer to do business with you.
(vi) Delivery time and flexibility: Can we deliver at the customers convenience.
(vii) Invoicing procedures and accuracy: Is the invoice correct and easy to process.
(viii) Claims procedures: How do we handle complaints or claims.
(ix) Conditions of goods: What is our record on quality of goods on arrival are they always in good conditions or damaged and of poor quality.
(x) Visits by sales people: Do our sales representatives act as sales ambassadors.
(xi) Order Status information: How well do we communicate with our customers about their.

It should be noted that in any particular product /service market and situation, some of these elements will be more important than others and there may be factors other than the above which have significance in a specific market.

Customer Service Policy:

Fundamental aspects of services provision must be supported by a sound policy. The policy must lay down criteria to be met by:

(i) The administrative system through providing right documentation.
(ii) The loading bay staff by making sure that final delivery instructions are fully met.
(iii) Laying down rules for drivers' dress and appearances code i.e. being clean and tidy at al times, weaning uniform if that is the case and being polite and caring (courteous).
(iv) Using modern vehicles which have to be well maintained and cleaned.

Other issues addressed by a customer service policy may include:

-Dealing with specific product complaints.
-Handling disgruntled customers.
-What to do when goods are refused and sent back as returns.

Steps in developing a customer service policy.

(i) identify the elements of a service
(ii) Determine the relative significance of each service element.
(iii) Establish company competitiveness at current service levels offered.
(iv) Identify distinct service requirements for different market segments.
(v) Develop specific customer service packages.
(vi) Determine the monetary and control procedures.

Components of customer service.

The components of customer service can be grouped in different ways. The customer service elements are multi-functional because customer service interfaces with a number of other departments. However, the elements can be grouped into three major categories:

(i) The pre-transaction elements.
(ii) The transaction elements
(iii) The post-transaction elements may include the following:

- Written customer service policy.
- Single order context point
- Organizational structure - who is responsible to who i.e. hierarchy and chain of command.
- Method of ordering – Is it possible to order for small quantities.
- Order size constraints.
- Systems flexibility.

The Transaction elements.

These are elements directly related to the physical transaction and they are those that are most commonly concerned with distribution and logistics. They include the following:

- Order cycle time – how long does it take for the customers to receive their orders.
- Order preparation – how and who prepares the order.
- Inventory availability – in case the customer needs more products, are they available in stock.
- Delivery alternatives – Are there alternatives for delivery or it is only by a specific vehicle and not any other.
- Delivery time – Is it specified and convenient to the customer do not deliver late in the evening or very early in the morning.
- Delivery reliability – is the delivery reliable i.e. isn't it liable to change the dates, time.

- Delivery of complete order – is the whole order delivered in its completeness or it is in halves i.e. incomplete.
- Conditions of goods – Are the goods delivered in the night condition or they are delivered when damaged or expired.
- Order status information – Are the products delivered with the relevant information as regards the order status.

The post – Transaction Elements.

These involve those elements that occur after the delivery has taken place, such factors include:

- Availability of spares – in case of breakdown, are spares available for repair of say equipment.
- Invoicing procedures – How will the invoices be paid, it is after a period of time e.g. 30 days or within one week.
- Product warranty - what is the specified time within which repairs will be done freely.
- Return policy – Is it possible to return materials which do not measures to the standard specified ad within which period is this allowed.
- Customer complaints and procedures – are customer complaints paid attentions to or they are just neglected.
- Claims procedures – Does the company consider claims for compensation for customers.

Customer service elements can also be classified by multi-functional dimensions. The intention is to assess the different components of customer service across the whole range of company functions so as to enable a sinless service provision.

Order Fulfillment:

This is an essential element of distribution /logistics process and customer service comprising the task of ensuring t hat the customer receives precisely what he/she ordered for at the time and place specified for delivery. The key to efficient and accurate order fulfillment is to ensure that:

(i) Orders are correctly received and interpreted.
(ii) Order are passed on correctly to the order picking and load /assembly function.
(iii) The correct documentation is raised e.g the invoices and delivery notes.
(iv) A Vehicle is scheduled for loading for and dispatch in time to meet the delivery time slot specified.

Factors that may lead to failure of order fulfillment:

(i) When the right goods are not delivered to the right location at the right time.
(ii) If not all of the foods specified in the order are delivered or wrong items are included in the consignment.
(iii) The goods arrive at the wrong address for delivery.
(iv) When the temperature recorder (for cool chain products) on the vehicle /trailer indicates that he road has been held on the vehicle during transit at a temperature either above or below that specified.

Failures in order fulfillment can often lead to returned loads, excessive costs incurred, lost future or breach of contract and loss of reputation. The logistics motto should therefore be "right first time- Right every time".

TRANSPORTATION:

When one talk about logistics, most people imagine lorries driving down the road. However, logistics has a wider meaning and transport is certainly one of the main components. Transport is responsible for the physical movement of materials between productions, in the supply chain. In planning transportation, the problems can be enormous and considerable hidden costs can be concealed such as the costs of out of stock positions which makes you lose your business or delays over insurance claims you have to finance.

Modes of Transport:

The logistics manager is concerned with the need to sight a type of transport which is most appropriate for a given delivery situation assuming there is a choice of every consequence of the local infrastructure. The choice of the transport mode is a fundamental part of distribution management which should be analyzed carefully because of the impact upon a company's operational efficiency.

Failure to identify the appropriate mode of transport may incur higher costs than unnecessary and may provide a lower customer service level than is potentially possible.

The decision upon the choice of the mode of transport is extremely complex because of the vast volume of choice available together with the numerous methods of examination and evaluation of each choice. Every organization involved in physical goods requires transport services. The nature of transport services will vary considerably depending on such factors like nature of the product, the size of the order, etc.

Every transport mode has its own unique characteristics mostly in such matters as:

- Speed
- Cost implications
- Reliability
- Security provision
- Environment impact
- Convenience and relevance
- Suitability of the routes covered.

There are various modes of transport but the most five prominent ones include the following:

(i) Road Transport
(ii) Rail transport
(iii) Air transport
(iv) Water transport
(v) Pipeline transport

General characteristics of transport modes

(i) Road Transport

- Flexible
- Convenient
- Reliable
- Less costly over short distances
- Slow especially during congestion time.
- Regulations as regards weight, speeding makes it inconveniencing.
- Makes it easy to use inter model transportation.
- Cannot be used in places with poor terrain.
- Generally suitable for shorter distances.

(ii) Rail Transport:

- Inflexibility in route and timing for journey.
- Carries relatively heavy loads of articles.
- Cheap over long distances
- Maintains a consistent reasonably high speed
- Can link with other modes to carry containers and bulk freight
- Costs can be reduced buy sharing facilities
- Once infrastructure is in place, it has very high capacity and low unit costs.
- Can be used to carry large volumes of low priced materials e.g. coal, minerals etc.

- Has limited access to other modes of transport.

(iii) Air Transport:

- Speed
- High cost both fixed and variable
- Security
- Inflexibility
- Transports delicate or fragile high value items.
- Usually small quantities and light articles are transported
- Rigid timetables
- Cannot be used without special infrastructure e.g. airport

(iv) Water Transport

- Slow to transport perishables
- Suitable for heavy articles.
- High risks and loss in case of accidents on the sea
- Inflexibility – can only be used where there are special facilities such as a port

Pipeline Transport

- inflexibility – pipelines follow a fixed route point
- incase of leakage, the loss incurred is very high.
- Pipelines cannot be constructed in areas with steep terrain
- Pipelines move large quantities of liquid over long distances.
- They are only able to carry large quantities of specific types of fluids not a variety.
- They have a high initial investment of building dedicated pipelines.
- It is the cheapest way to transport liquids particularly oil and over long distances.

Factors that influence the choice of a transport mode.

The choice of a particular mode or combination of modes will depend on a number of factors such as the following:

(i) Whether the delivery is solely domestic or global: If it is domestic then road transport would be preferred and for global delivery air, water transport modes are preferable.

(ii) Cost: Rail transport is considerably cheaper compared to air and road. However, this should take into consideration the nature of items being transported.

(iii) Suitability of the mode of transport: In case of perishables or fragile products, air transport would be preferred while water and railway transport are suitable for bulky and imperishable.
(iv) Availability of the mode: Road transport mode is easily available because there are several trucks and delivery vehicles.
(v) Flexibility of the mode: Road transport is more flexible in terms of scheduling and delivery at various stations/points.
(vi) Speed of the mode: Rail transport is relatively fast as compared to other modes and therefore suitable for transportation of urgent items with urgent demand.
(vii) **Reliability**: Road transport is more reliable as compared to the others.
(viii) Legal restrictions: Air transport has more restrictions as regards weight of the load.
(ix) Packaging and documentation requirements: In case of dangerous items being transported by road, then they have to meet certain packaging requirements yet this might not be the case with rail transport.

Slater in Gattoma (1990), has categorized the factors in the choice of the transport mode into four categories.

(i) Customer characteristics:

These must ensure that delivery is profit. They include:

- Geographical location i.e. the distance from the supply depot. If the distance is too long, then air and railway transport could be appropriate.
- Delivery point features/accessibility of the delivery point. The mode used should be one which has access to the delivery point without difficulty .
- Time restrictions: It is advisable to use a transport with a flexible timetable to cater for uncontrollable delays. And road transport proves to have flexible timetables.
- Size of the Order: In case the order is large in quantity, rail or water transport is recommendable compared to air transport.

(i) Product characteristics:

These include the following:

- Weight: Railway and water transport are preferred for heavy weight.
- Site and shop: In case the products have a complex size or shape, then water transport is preferred as compared to road and air.

- Fragile or delicate nature of the products: Air transport would be preferred of this nature instead of road, rail and water modes.
- Danger: Pipeline transport is preferred for hazardous products e.g. flammable gases, corrosive liquids.
- Value: In case the products are of a high value, it is advisable to use air transport e.g. diamond gold.

(ii) Company Characteristics:

It is important that distribution/logistics management fully understands all significant company policies to avoid over-reacting to pressure from customers or management colleagues. The most important company characteristics to consider include:

- Service level policy. How do we make our products available to our customers – as soon as they need them in a more convenient way.
- Warehouse locations: If they are located near a rail station then rail transport is the most appropriate mode.
- Manufacturing locations: If they are located near the sea, then water-transport is suitable.
- Performance of competition: If competition is high, then air transport is suitable to minimize or reduce on the time to market.

STORAGE AND HANDLING OF MATERIALS: 3 of 1

Too much storage entails unnecessary expenditure on rent, rates, heating, water and maintenance. Typically building and building services costs can be as 35% - 40% of total annual storage costs. While too little storage results in inefficiency due to un-suitable storage locations, methods and material flow.

General stores objectives:

- Most efficient use of space provided by the building cube.
- Rapid and easy access to stock
- Minimal travel distance of stock movements.
- Positive location and identification of stock.
- Grouping of products with similar storage characteristics and according to frequency of receipts and issues.
- Maximum protection and security of stores items.
- An orderly and efficient stores appearance.

Stores Layout:

Stores layout can be considered from the aspects of:

- Materials flow –
- Materials identification.
- Location and space utilization.

The two fundamental influences in stores are:

- The shape of the stores building.
- The type of 'flow' through out the building.

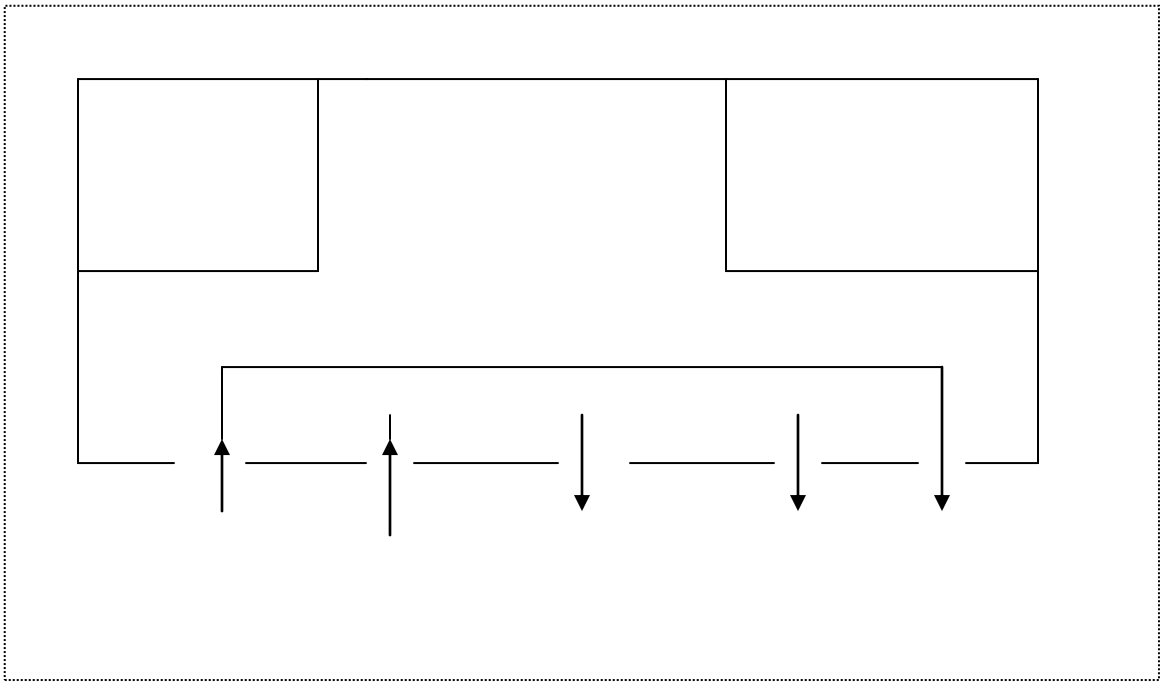
The Institute of Logistics' Publication Principles of Warehouse Design identifies four types of layout deriving from the above two factors.

a) The Inverted 'T' warehouse flow.

Characteristics:

- Goods in and goods out are on the same side of the building.
- Shape allow the use of 'high', 'medium' and 'low' usage to minimize materials handling by locating 'high' and 'low' usage areas respectively nearest to and furthest from the goods received and goods outward areas thus minimizing materials handling for high usage items.

Illustration: The inverted 'T' warehouse flow.



Advantages claimed for this layout include:

- Better utilization of receiving and issue areas and the associated mechanical handling equipment.
- The total area required is less than where there are separate loading and unloading areas.
- Unified by operations provide for better security control and easier surveillance. However, the center aisle may become congested in high throughput situations.

b) The Cross 'flow' warehouse'

The flow in this type of layout is a one-way system with an 'in-feed' aisle and a separate 'out-flow' from the other end of the racks. Front entry and dispatches use a common yard are and retains the benefits of the inverted 'T' approach.

Factors for the location and layout of stores/warehouse:

(i) Consider the nature of materials to be stored i.e. are they raw materials, finished goods or hazardous materials.
(ii) The quantity of materials to be used. The more the quantity, the larger the stores.
(iii) Utilization of floor and airspace. The floor space and airspace should be utilized maximumly both horizontal and vertical.
(iv) Possibility of future expansion. In case the need to expand arises there should be enough space to avoid shifting stores from one place to another or alteration of the layout.
(v) Accessibility: The place in which to locate stores must be convenient to reach without difficulty, suppliers and other customers should be able to locate the stores with ease.
(vi) The type of storage equipment to be used. The layout should take into consideration the type of aisles, bins and racks so as to minimize on the instances of accidents.
(vii) Use of handling devices: Consideration should be given to how far the various equipment can be advantageously used to save labor and time in handling materials. E.g. in a finished goods store, pallets and conventional racks can be advantageously used.
(viii) Security: Stores should be located in a place with adequate security i.e. they should not be located near walls to avoid instances of robbery, theft among other evils.
(ix) Climatic conditions e.g. drainage of the area depending on the nature of materials stored.
(x) Economic factors in terms of roads, utilities etc.

Transport

Transport or **transportation** is the movement of people, animals and goods from one location to another. Modes of transport include air, rail, road, water, cable, pipeline, and space. The field can be divided into infrastructure, vehicles, and operations. Transport is important since it enables trade between peoples, which in turn establishes civilizations.

Transport infrastructure consists of the fixed installations necessary for transport, and may be roads, railways, airways, waterways, canals and pipelines, and terminals such as airports, railway stations, bus stations, warehouses, trucking terminals, refueling depots (including fueling docks and fuel stations), and seaports. Terminals may be used both for interchange of passengers and cargo and for maintenance.

Vehicles traveling on these networks may include automobiles, bicycles, buses, trains, trucks, people, helicopters, and aircraft. Operations deal with the way the vehicles are operated, and the procedures set for this purpose including financing, legalities and policies. In the transport industry, operations and ownership of infrastructure can be either public or private, depending on the country and mode.

Passenger transport may be public, where operators provide scheduled services, or private. Freight transport has become focused on containerization, although bulk transport is used for large volumes of durable items. Transport plays an important part in economic growth and globalization, but most types cause air pollution and use large amounts of land. While it is heavily subsidized by governments, good planning of transport is essential to make traffic flow, and restrain urban sprawl.

Mode

A mode of transport is a solution that makes use of a particular type of vehicle, infrastructure and operation. The transport of a person or of cargo may involve one mode or several modes, with the latter case being called intermodal or multimodal transport. Each mode has its advantages and disadvantages, and will be chosen for a trip on the basis of cost, capability, route, and speed.

Human-powered

Human-powered transport remains common in developing countries.Human powered transport is the transport of people and/or goods using human muscle-power, in the form of walking, running and swimming. Modern technology has allowed machines to enhance human-power. Human-powered transport remains popular for reasons of cost-saving, leisure, physical exercise and environmentalism. Human-powered transport is sometimes the only type available, especially in underdeveloped or inaccessible regions. It is considered an ideal form of sustainable transportation.

Although humans are able to walk without infrastructure, the transport can be enhanced through the use of roads, especially when using the human power with vehicles, such as bicycles and inline skates. Human-powered vehicles have also been developed for difficult environments, such as snow and water, by watercraft rowing and skiing; even the air can be entered with human-powered aircraft.

Animal-powered

Animal-powered transport is the use of working animals for the movement of people and goods. Humans may ride some of the animals directly, use them as pack animals for carrying goods, or harness them, alone or in teams, to pull sleds or wheeled vehicles.

Air

A fixed-wing aircraft, commonly called airplane, is a heavier-than-air craft where movement of the air in relation to the wings is used to generate lift. The term is used to distinguish from rotary-wing aircraft, where the movement of the lift surfaces relative to the air generates lift. A gyroplane is both fixed-wing and rotary-wing. Fixed-wing aircraft range from small trainers and recreational aircraft to large airliners and military cargo aircraft.

Two things necessary for aircraft are air flow over the wings for lift and an area for landing. The majority of aircraft also need an airport with the infrastructure to receive maintenance, restocking, refueling and for the loading and unloading of crew, cargo and passengers. While the vast majority of aircraft land and take off on land, some are capable of take off and landing on ice, snow and calm water.

The aircraft is the second fastest method of transport, after the rocket. Commercial jets can reach up to 955 kilometres per hour (593 mph), single-engine aircraft 555 kilometres per hour (345 mph). Aviation is able to quickly transport people and limited amounts of cargo over longer distances, but incur high costs and energy use; for short distances or in inaccessible places helicopters can be used.[1] As of April 28, 2009 *The Guardian* article notes that, "the WHO estimates that up to 500,000 people are on planes at any time."[2]

Rail

Rail transport is where a train runs along a set of two parallel steelrails, known as a railway or railroad. The rails are anchored perpendicular to ties (or sleepers) of timber, concrete or steel, to maintain a consistent distance apart, or gauge. The rails and perpendicular beams are placed on a foundation made

of concrete, or compressed earth and gravel in a bed of ballast. Alternative methods include monorail and maglev.

A train consists of one or more connected vehicles that run on the rails. Propulsion is commonly provided by a locomotive, that hauls a series of unpowered cars, that can carry passengers or freight. The locomotive can be powered by steam, diesel or by electricity supplied by trackside systems. Alternatively, some or all the cars can be powered, known as a multiple unit. Also, a train can be powered by horses, cables, gravity, pneumatics and gas turbines. Railed vehicles move with much less friction than rubber tires on paved roads, making trains more energy efficient, though not as efficient as ships.

Intercity trains are long-haul services connecting cities;[3] modern high-speed rail is capable of speeds up to 350 km/h (220 mph), but this requires specially built track. Regional and commuter trains feed cities from suburbs and surrounding areas, while intra-urban transport is performed by high-capacity tramways and rapid transits, often making up the backbone of a city's public transport. Freight trains traditionally used box cars, requiring manual loading and unloading of the cargo. Since the 1960s, container trains have become the dominant solution for general freight, while large quantities of bulk are transported by dedicated trains.

Road

A road is an identifiable route, way or path between two or more places.[4] Roads are typically smoothed, paved, or otherwise prepared to allow easy travel;[5] though they need not be, and historically many roads were simply recognizable routes without any formal construction or maintenance.[6] In urban areas, roads may pass through a city or village and be named as streets, serving a dual function as urban space easement and route.[7]

The most common road vehicle is the automobile; a wheeled passenger vehicle that carries its own motor. Other users of roads include buses, trucks, motorcycles, bicycles and pedestrians. As of 2002, there were 590 million automobiles worldwide.

Automobiles offer high flexibility and with low capacity, but are deemed with high energy and area use, and the main source of noise and air pollution in cities; buses allow for more efficient travel at the cost of reduced flexibility.[8] Road transport by truck is often the initial and final stage of freight transport.

Water

Built by the Dutch to transport spices, now used by the local fisherman to get to the sea, Negombo Dutch canal, Sri Lanka

Water transport is the process of transport a watercraft, such as a barge, boat, ship or sailboat, makes over a body of water, such as a sea, ocean, lake, canal or river. The need for buoyancy unites watercraft, and makes the hull a dominant aspect of its construction, maintenance and appearance.

In the 19th century the first steam ships were developed, using a steam engine to drive a paddle wheel or propeller to move the ship. The steam was produced in a boiler using wood or coal and fed through a steam external combustion engine. Now most ships have an internal combustion engine using a slightly refined type of petroleum called bunker fuel. Some ships, such as submarines, use nuclear power to produce the steam. Recreational or educational craft still use wind power, while some smaller craft use internal combustion engines to drive one or more propellers, or in the case of jet boats, an inboard water jet. In shallow draft areas, hovercraft are propelled by large pusher-prop fans. (See Marine propulsion.)

Although slow, modern sea transport is a highly efficient method of transporting large quantities of goods. Commercial vessels, nearly 35,000 in number, carried 7.4 billion tons of cargo in 2007. Transport by water is significantly less costly than air transport for transcontinental shipping; short sea shipping and ferries remain viable in coastal areas.

Other modes

Pipeline transport sends goods through a pipe, most commonly liquid and gases are sent, but pneumatic tubes can also send solid capsules using compressed air. For liquids/gases, any chemically stable liquid or gas can be sent through a pipeline. Short-distance systems exist for sewage, slurry, water and beer, while long-distance networks are used for petroleum and natural gas.

Cable transport is a broad mode where vehicles are pulled by cables instead of an internal power source. It is most commonly used at steep gradient. Typical solutions include aerial tramway, elevators, escalator and ski lifts; some of these are also categorized as conveyor transport.

Spaceflight is transport out of Earth's atmosphere into outer space by means of a spacecraft. While large amounts of research have gone into technology, it is rarely used except to put satellites into orbit, and conduct scientific experiments. However, man has landed on the moon, and probes have been sent to all the planets of the Solar System.

Suborbital spaceflight is the fastest of the existing and planned transport systems from a place on Earth to a distant other place on Earth. Faster transport could be achieved through part of a Low Earth orbit, or following that trajectory even faster using the propulsion of the rocket to steer it.

Elements

Infrastructure

Bridges, such as Golden Gate Bridge, allow roads and railways to cross bodies of water. Infrastructure is the fixed installations that allow a vehicle to operate. It consists of both a way, terminal and facilities for parking and maintenance. For rail, pipeline, road and cable transport, the entire way the vehicle travels must be built up. Air and water craft are able to avoid this, since the airway and seaway do not need to be built up. However, they require fixed infrastructure at terminals.

Terminals such as airports, ports and stations, are locations where passengers and freight can be transferred from one vehicle or mode to another. For passenger transport, terminals are integrating different modes to allow riders to interchange to take advantage of each mode's advantages. For instance, airport rail links connect airports to the city centers and suburbs. The terminals for automobiles are parking lots, while buses and coaches can operates from simple stops. For freight, terminals act as transshipment points, though some cargo is transported directly from the point of production to the point of use.

The financing of infrastructure can either be public or private. Transport is often a natural monopoly and a necessity for the public; roads, and in some countries railways and airports are funded through taxation. New infrastructure projects can involve large spendings, and are often financed through debt. Many infrastructure owners therefore impose usage fees, such as landing fees at airports, or toll plazas on roads. Independent of this, authorities may impose taxes on the purchase or use of vehicles.

Vehicles

A vehicle is any non-living device that is used to move people and goods. Unlike the infrastructure, the vehicle moves along with the cargo and riders. Vehicles that do not operate on land, are usually called crafts. Unless being pulled by a cable or muscle-power, the vehicle must provide its own propulsion; this is most commonly done through a steam engine, combustion engine, electric motor, a jet engine or a rocket, though other means of propulsion also exist. Vehicles also need a system of converting the energy into movement; this is most commonly done through wheels, propellers and pressure.

Vehicles are most commonly staffed by a driver. However, some systems, such as people movers and some rapid transits, are fully automated. For passenger transport, the vehicle must have a compartment for the passengers. Simple vehicles, such as automobiles, bicycles or simple aircraft, may have one of the passengers as a driver.

Operation

Private transport is only subject to the owner of the vehicle, who operates the vehicle themselves. For public transport and freight transport, operations are done through private enterprise or by governments. The infrastructure and vehicles may be owned and operated by the same company, or they may be operated by different entities. Traditionally, many countries have had a national airline and national railway. Since the 1980s, many of these have been privatized. International shipping remains a highly competitive industry with little regulation, but ports can be public owned.

Function

Relocation of travelers and cargo are the most common uses of transport. However, other uses exist, such as the strategic and tactical relocation of armed forces during warfare, or the civilian mobility construction or emergency equipment.

Passenger

Passenger transport, or travel, is divided into public and private transport. Public is scheduled services on fixed routes, while private is vehicles that provide ad hoc services at the riders desire. The latter offers better flexibility, but has lower capacity, and a higher environmental impact. Travel may be as part of daily commuting, for business, leisure or migration.

Short-haul transport is dominated by the automobile and mass transit. The latter consists of buses in rural and small cities, supplemented with commuter rail, trams and rapid transit in larger cities. Long-haul transport involves the use of the automobile, trains, coaches and aircraft, the last of which have become predominantly used for the longest, including intercontinental, travel. Intermodal passenger transport is where a journey is performed through the use of several modes of transport; since all human transport normally starts and ends with walking, all passenger transport can be considered intermodal. Public transport may also involve the intermediate change of vehicle, within or across modes, at a transport hub, such as a bus or railway station.

Taxis and Buses can be found on both ends of Public Transport spectrum, whereas Buses remain the cheaper mode of transport but are not necessarily flexible, and Taxis being very flexible but more expensive. In the middle is Demand responsive transport offering flexibility whilst remaining affordable.

International travel may be restricted for some individuals due to legislation and visa requirements.

Freight

Freight transport, or shipping, is a key in the value chain in manufacturing.[16] With increased specialization and globalization, production is being located further away from consumption, rapidly increasing the demand for transport. While all modes of transport are used for cargo transport, there is high differentiation between the nature of the cargo transport, in which mode is chosen.[18]Logistics refers to the entire process of transferring products from producer to consumer, including storage, transport, transshipment, warehousing, material-handling and packaging, with associated exchange of information.[19]Incoterm deals with the handling of payment and responsibility of risk during transport.

Containerization, with the standardization of ISO containers on all vehicles and at all ports, has revolutionized international and domestic trade, offering huge reduction in transshipment costs. Traditionally, all cargo had to be manually loaded and unloaded into the haul of any ship or car; containerization allows for automated handling and transfer between modes, and the standardized sizes allow for gains in economy of scale in vehicle operation. This has been one of the key driving factors in international trade and globalization since the 1950s.[21]

Bulk transport is common with cargo that can be handled roughly without deterioration; typical examples are ore, coal, cereals and petroleum. Because of the uniformity of the product, mechanical handling can allow enormous quantities to be handled quickly and efficiently. The low value of the cargo combined with high volume also means that economies of scale become essential in transport, and gigantic ships and whole trains are commonly used to transport bulk. Liquid products with sufficient volume may also be transported by pipeline.

Air freight has become more common for products of high value; while less than one percent of world transport by volume is by airline, it amounts to forty percent of the value. Time has become especially important in regards to principles such as postponement and just-in-time within the value chain, resulting in a high willingness to pay for quick delivery of key components or items of high value-to-weight ratio.[22] In addition to mail, common items sent by air include electronics and fashion clothing.

History

Humans' first means of transport were walking and swimming. The domestication of animals introduces a new way to lay the burden of transport on more powerful creatures, allowing heavier loads to be hauled, or humans to ride the animals for higher speed and duration. Inventions such as the wheel

and sled helped make animal transport more efficient through the introduction of vehicles. Also water transport, including rowed and sailed vessels, dates back to time immemorial, and was the only efficient way to transport large quantities or over large distances prior to the Industrial Revolution.

The first forms of road transport were horses, oxen or even humans carrying goods over dirt tracks that often followed gametrails. Paved roads were built by many early civilizations, including Mesopotamia and the Indus Valley Civilization. The Persian and Roman empires built stone-paved roads to allow armies to travel quickly. Deep roadbeds of crushed stone underneath ensured that the roads kept dry. The medieval Caliphate later built tar-paved roads. The first watercraft werecanoes cut out from tree trunks. Early water transport was accomplished with ships that were either rowed or used the wind for propulsion, or a combination of the two. The importance of water has led to most cities, that grew up as sites for trading, being located on rivers or at sea, ofter at the intersection of two bodies of water. Until the Industrial Revolution, transport remained slow and costly, and production and consumption were located as close to each other as feasible.

The Industrial Revolution in the 19th century saw a number of inventions fundamentally change transport. With telegraphy, communication became instant and independent of transport. The invention of the steam engine, closely followed by its application in rail transport, made land transport independent of human or animal muscles. Both speed and capacity increased rapidly, allowing specialization through manufacturing being located independent of natural resources. The 19th century also saw the development of the steam ship, that sped up global transport.

With the development of the combustion engine and the automobile at the turn into the 20th century, road transport became more viable, allowing the introduction of mechanical private transport. The first highways were constructed during the 19th century with macadam. Later, tarmac and concrete became the dominant paving material. In 1903, the first controllable airplane was invented, and after World War I, it became a fast way to transport people and express goods over long distances.[23]

After World War II, the automobile and airlines took higher shares of transport, reducing rail and water to freight and short-haul passenger.[24] Spaceflight was launched in the 1950s, with rapid growth until the 1970s, when interest dwindled. In the 1950s, the introduction of containerization gave massive efficiency gains in freight transport, permitting globalization.[21] International air travel became much more accessible in the 1960s, with the commercialization of the jet engine. Along with the growth in automobiles and motorways, this introduced a decline for rail and water transport. After the introduction of the Shinkansen in 1964, high-speed rail in Asia and Europe started taking passengers on long-haul routes from airlines.[24]

Early in U.S. history, most aqueducts, bridges, canals, railroads, roads, and tunnels were owned by privatejoint-stockcorporations. Most such transportation infrastructure came under government control in the late 19th and early 20th centuries, culminating in the nationalization of inter-city passenger rail service with the creation of Amtrak. Recently, however, a movement to privatize roads and other infrastructure has gained some ground and adherents.[25]

Impact

Economic

Transport is a key component of growth and globalization, such as in Seattle, Washington, United States. Transport is a key necessity for specialization—allowing production and consumption of products to occur at different locations. Transport has throughout history been a spur to expansion; better transport allows more trade and a greater spread of people. Economic growth has always been dependent on increasing the capacity and rationality of transport.[26] But the infrastructure and operation of transport has a great impact on the land and is the largest drainer of energy, making transport sustainability a major issue.

Modern society dictates a physical distinction between home and work, forcing people to transport themselves to places of work or study, as well as to temporarily relocate for other daily activities. Passenger transport is also the essence of tourism, a major part of recreational transport. Commerce requires the transport of people to conduct business, either to allow face-to-face communication for important decisions or to move specialists from their regular place of work to sites where they are needed.

Planning

Transport planning allows for high utilization and less impact regarding new infrastructure. Using models of transport forecasting, planners are able to predict future transport patterns. On the operative level, logistics allows owners of cargo to plan transport as part of the supply chain. Transport as a field is studied through transport economics, the backbone for the creation of regulation policy by authorities. Transport engineering, a sub-discipline of civil engineering, and must take into account trip generation, trip distribution, mode choice and route assignment, while the operative level is handled through traffic engineering.

The engineering of this roundabout in Bristol, United Kingdom, attempts to make traffic flow free-moving

Because of the negative impacts made, transport often becomes the subject of controversy related to choice of mode, as well as increased capacity. Automotive transport can be seen as a tragedy of the commons, where the flexibility and comfort for the individual deteriorate the natural and urban environment for all. Density of development depends on mode of transport, with public transport allowing for better spacial utilization. Good land use keeps common activities close to peoples homes and places higher-density development closer to transport lines and hubs; minimize the need for transport. There are economies of agglomeration. Beyond transportation some land uses are more efficient when clustered. Transportation facilities consume land, and in cities, pavement (devoted to streets and parking) can easily exceed 20 percent of the total land use. An efficient transport system can reduce land waste.

Too much infrastructure and too much smoothing for maximum vehicle throughput means that in many cities there is too much traffic and many—if not all—of the negative impacts that come with it. It is only in recent years that traditional practices have started to be questioned in many places, and as a result of new types of analysis which bring in a much broader range of skills than those traditionally relied on—spanning such areas as environmental impact analysis, public health, sociologists as well as economists who increasingly are questioning the viability of the old mobility solutions. European cities are leading this transition.

Environment

Transport is a major use of energy and burns most of the world's petroleum. This creates air pollution, including nitrous oxides and particulates, and is a significant contributor to global warming through emission of carbon dioxide,[27] for which transport is the fastest-growing emission sector.[28] By subsector, road transport is the largest contributor to global warming.[29]Environmental regulations in developed countries have reduced individual vehicles' emissions; however, this has been offset by increases in the numbers of vehicles and in the use of each vehicle.[27] Some pathways to reduce the carbon emissions of road vehicles considerably have been studied.[30][31] Energy use and emissions vary largely between modes, causing environmentalists to call for a transition from air and road to rail and human-powered transport, as well as increased transport electrification and energy efficiency.

Other environmental impacts of transport systems include traffic congestion and automobile-oriented urban sprawl, which can consume natural habitat and agricultural lands. By reducing transportation emissions globally, it is predicted that there will be significant positive effects on Earth's air quality, acid rain, smog and climate change.[32]

Transportation management system

A **transportation management system (TMS)** is a subset of supply chain management concerning transportation operations and may be part of an enterprise resource planning system.

A TMS usually "sits" between an ERP or legacy order processing and warehouse/distribution module. A typical scenario would include both inbound (procurement) and outbound (shipping) orders to be evaluated by the TMS Planning Module offering the user various suggested routing solutions. These solutions are evaluated by the user for reasonableness and are passed along to the transportation provider analysis module to select the best mode and least cost provider. Once the best provider is selected, the solution typically generates electronic load tendering and track/trace to execute the optimized shipment with the selected carrier, and later to support freight audit and payment (settlement process). Links back to ERP systems (after orders turned into optimal shipments), and sometimes secondarily to WMS programs also linked to ERP are also common.

Licensing

Recently, these systems have been offered with many different types of licensing arrangements. These different arrangements have given shippers who otherwise would not be able to afford sophisticated software the opportunity to utilize TMS to better manage this vital function. The 3 primary offerings are:

1. *On-premise licensing* (traditional purchased license)
2. *Hosted licensing* (remote, Saas, Cloud)
3. *On-premise hosted licensing* (a blend of 1 and 2)

Additionally, some software providers have either been acquired or merged with traditional supply chain management consultancies and are now offering shippers "blended" managed and software services as an outsourced process. *Primary Tier 1* TMS providers are still independent, carrier and 3PL neutral, and ERP neutral.

Functionalities

Transportation management systems manage four key processes of transportation management:

1. **Planning and decision making** – TMS will define the most efficient transport schemes according to given parameters, which have a lower or higher importance according to the user policy: transport cost, shorter lead-time, fewer stops possible to ensure quality, flows regrouping coefficient, etc.

2. **Transportation Execution** – TMS will allow for the execution of the transportation plan such as carrier rate acceptance, carrier dispatching, EDI etc..
3. **Transport follow-up** – TMS will allow following any physical or administrative operation regarding transportation: traceability of transport event by event (shipping from A, arrival at B, customs clearance, etc.), editing of reception, custom clearance, invoicing and booking documents, sending of transport alerts (delay, accident, non-forecast stops…)
4. **Measurement** – TMS have or need to have a logistics key performance indicator (KPI) reporting function for transport.

Various functions of a TMS include but not limited to:

- Planning and optimizing of terrestrial transport rounds
- Inbound and outbound transportation mode and transportation provider selection
- Management of motor carrier, rail, air and maritime transport
- Real time transportation tracking
- Service quality control in the form of KPI's (see below)
- Vehicle Load and Route optimization
- Transport costs and scheme simulation
- Shipment batching of orders
- Cost control, KPI (Key performance indicators) reporting and statistics
    - Typical KPIs include but not limited to:
        1. % of On Time Pick Up or Delivery Performance relative to requested
        2. Cost Per Metric - mile; km; Weight; Cube; Pallet
        3. Productivity in monetary terms, e.g. $/lb or $/shipping unit
        4. Productivity in operational terms, e.g. shipping units/order or weight/load

Performance indicator

A **performance indicator** or **key performance indicator** (**KPI**) is an industry jargon for a type of performance measurement.[1] KPIs are commonly used by an organization to evaluate its success or the success of a particular activity in which it is engaged. Sometimes success is defined in terms of making progress toward strategic goals,[2] but often success is simply the repeated achievement of some level of operational goal (for example, zero defects, 10/10 customer satisfaction, etc.). Accordingly, choosing the right KPIs is reliant upon having a good understanding of what is important to the organization. 'What is important' often depends on the department measuring the performance - the KPIs useful to finance will be quite different than the KPIs assigned to sales, for example. Because of the need to develop a good understanding of what is important, performance indicator selection is often closely associated with the

use of various techniques to assess the present state of the business, and its key activities. These assessments often lead to the identification of potential improvements; and as a consequence, performance indicators are routinely associated with 'performance improvement' initiatives. A very common way for choosing KPIs is to apply a management framework such as the balanced scorecard.

Categorization of indicators

Key performance indicators define a set of values used to measure against. These raw sets of values, which are fed to systems in charge of summarizing the information, are called **indicators**. Indicators identifiable as possible candidates for KPIs can be summarized into the following sub-categories:

- **Quantitative indicators** which can be presented as a number.
- **Practical indicators** that interface with existing company processes.
- **Directional indicators** specifying whether an organization is getting better or not.
- **Actionable indicators** are sufficiently in an organization's control to affect change.
- **Financial indicators** used in performance measurement and when looking at an operating index.

Key performance indicators, in practical terms and for strategic development, are *objectives* to be targeted that will add the most *value* to the business.[*citation needed*] These are also referred to as key success indicators.

Some important aspects

Key performance indicators (KPIs) are ways to periodically assess the performances of organizations, business units, and their division, departments and employees. Accordingly, KPIs are most commonly defined in a way that is understandable, meaningful, and measurable. They are rarely defined in such a way such that their fulfillment would be hampered by factors seen as non-controllable by the organizations or individuals responsible. Such KPIs are usually ignored by organizations.

In order to be evaluated, KPIs are linked to target values, so that the value of the measure can be assessed as meeting expectations or not.

Identifying indicators of organization

Performance indicators differ from business drivers and aims (or goals). A school might consider the failure rate of its students as a key performance indicator which might help the school understand its position in the

educational community, whereas a business might consider the percentage of income from returning customers as a potential KPI.

The key stages in identifying KPIs are:

- Having a pre-defined business process (BP).
- Having requirements for the BPs.
- Having a quantitative/qualitative measurement of the results and comparison with set goals.
- Investigating variances and tweaking processes or resources to achieve short-term goals.

A KPI can follow the SMART criteria. This means the measure has a **S**pecific purpose for the business, it is **M**easurable to really get a value of the KPI, the defined norms have to be **A**chievable, the improvement of a KPI has to be **R**elevant to the success of the organization, and finally it must be **T**ime phased, which means the value or outcomes are shown for a predefined and relevant period.

KPI examples

Marketing

Some examples are:

1. New customers acquired
2. Demographic analysis of individuals (potential customers) applying to become customers, and the levels of approval, rejections, and pending numbers.
3. Status of existing customers
4. Customer attrition
5. Turnover (i.e., revenue) generated by segments of the customer population.
6. Outstanding balances held by segments of customers and terms of payment.
7. Collection of bad debts within customer relationships.
8. Profitability of customers by demographic segments and segmentation of customers by profitability.

Many of these customer KPIs are developed and managed with customer relationship management software.

Faster availability of data is a competitive issue for most organizations. For example, businesses which have higher operational/credit risk (involving for

example credit cards or wealth management) may want weekly or even daily availability of KPI analysis, facilitated by appropriate IT systems and tools.

Manufacturing

Overall equipment effectiveness, is a set of broadly accepted non-financial metrics which reflect manufacturing success.

- **Cycle Time** – Cycle time is the total time from the beginning to the end of your process, as defined by you and your customer. Cycle time includes process time, during which a unit is acted upon to bring it closer to an output, and delay time, during which a unit of work is spent waiting to take the next action.
- **Cycle Time Ratio** (CTR) – CTR = Standard Cycle Time / Real Cycle Time
- Utilization
- Rejection rate

Supply Chain Management

Businesses can utilize KPIs to establish and monitor progress toward a variety of goals, including lean manufacturing objectives, minority business enterprise and diversity spending, environmental "green" initiatives, cost avoidance programs and low-cost country sourcing targets.

Any business, regardless of size, can better manage supplier performance with the help of KPIs robust capabilities, which include:

- Automated entry and approval functions
- On-demand, real-time scorecard measures
- Rework on procured inventory.
- Single data repository to eliminate inefficiencies and maintain consistency
- Advanced workflow approval process to ensure consistent procedures
- Flexible data-input modes and real-time graphical performance displays
- Customized cost savings documentation
- Simplified setup procedures to eliminate dependence upon IT resources.

Main SCM KPIs will detail the following processes:

- Sales forecasts
- Inventory
- Procurement and suppliers
- Warehousing
- Transportation
- Reverse logistics

Suppliers can implement KPIs to gain an advantage over the competition. Suppliers have instant access to a user-friendly portal for submitting standardized cost savings templates. Suppliers and their customers exchange vital supply chain performance data while gaining visibility to the exact status of cost improvement projects and cost savings documentation.

Government

The provincial government of Ontario, Canada has been using KPI since 1998 to measure the performance of higher education institutions in the province. All post secondary schools collect and report performance data in five areas – graduate satisfaction, student satisfaction, employer satisfaction, employment rate, and graduation rate.[3]

Further performance indicators

- Duration of a stockout situation
- Customer order waiting time

Problems

In practice, overseeing key performance indicators can prove expensive or difficult for organizations. Some indicators such as staff morale may be impossible to quantify. As such dubious KPIs can be adopted that can be used as a rough guide rather than a precise benchmark.

Another serious issue in practice is that once a measure is created, it becomes difficult to adjust to changing needs as historical comparisons will be lost. As such measures are kept even if of dubious relevance, because history does exist.

Comparisons between different organizations are often difficult as they depend on specific in-house practices and policies.

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