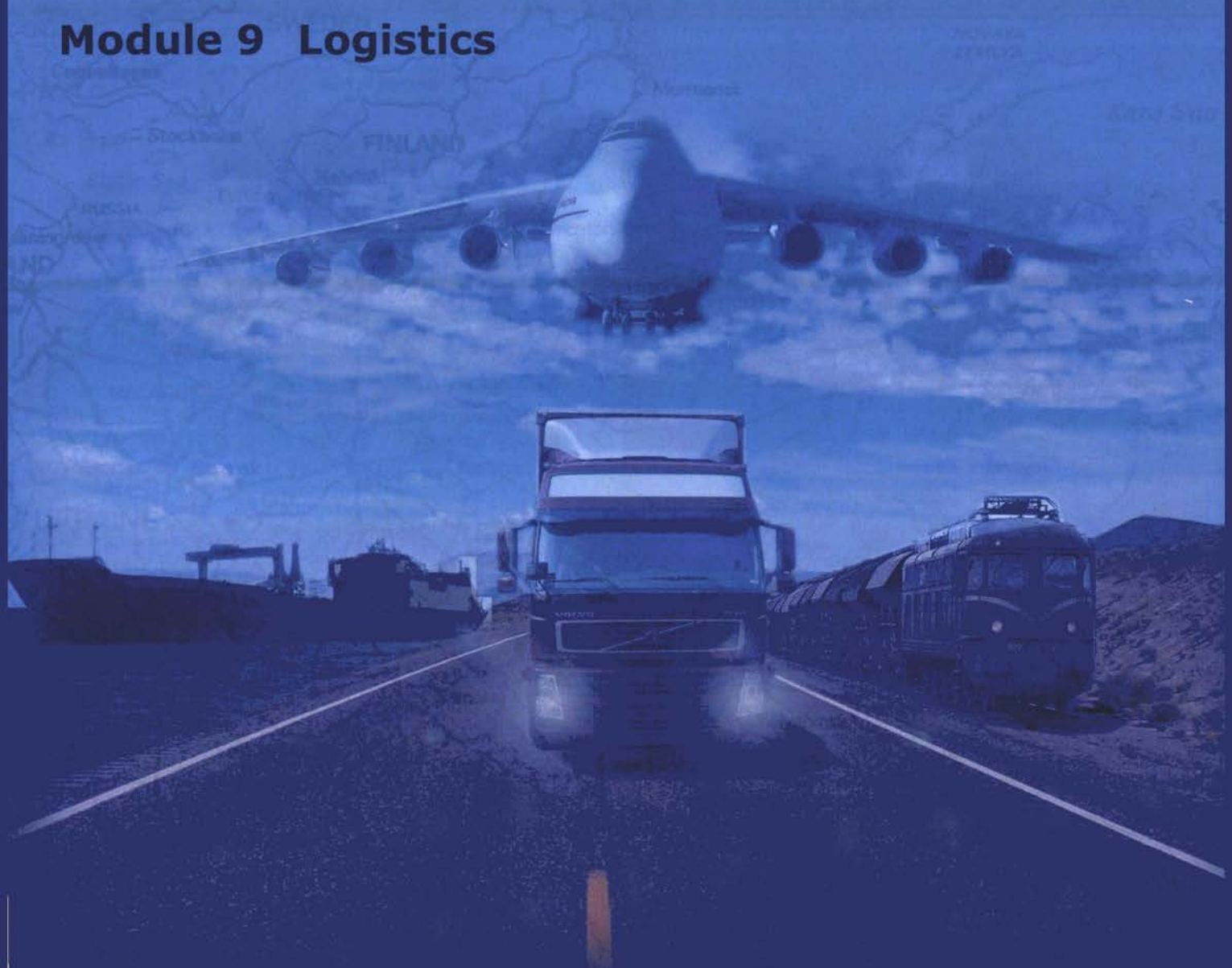


Freight Forwarders Training Courses

for Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Tajikistan, Turkmenistan, Ukraine, Uzbekistan

Module 9 Logistics



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9 LOGISTICS AND FORWARDING

Learning objectives

The student should understand the definition of logistics.

The student should be aware of the historical development of logistics.

The student should understand the main activities in logistics.

The student should understand the difference between provision of logistics services under own management or by outsourcing and related tendering.

The student should understand the importance of quality management in logistics.

9.1 Introduction

Learning objectives:

The student should understand the definition of “logistics”. He should understand its background. He should know logistic sub-systems.

The American trade organisation Council of Logistics Management (CLM, 1999) gives the following definition:

‘Logistics 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 from the point of origin to the point of consumption for the purpose of conforming to customer requirements. The definition includes inbound, outbound, internal and external movements and return of materials for environmental purposes.’

The original term “Logistics” dates back more than two centuries, originating from the military, where it means the supply of fighting troops with all necessary material (fuel, ammunition, foodstuff, etc.) and with lodging.

The word “logistics” originates from the Greek “logos“, i.e. word, sense, counting.

The Byzant emperor Leontos VI. (886-911) and later the Swiss general Antoine-Henri Jomini (book “The Art of War”, Paris 1837) where the first who connected logistics with military tasks, especially with the supply of troops.

During World War II logistics received special attention during the war in the Pacific when American troops moved from island to island (“Island hopping”) and had to be supplied with the right quantity of material, at the right time and at the right place.

The term is now used widely in the civil sector to indicate a wide variety of activities. Every company that has to do with the transport, storage, trading or manufacturing of products and services employs the term Logistics in one way or another. Random use of the word occurred, as a result. From the various definitions that exist for Logistics it is clear that goods and services are always involved.

Goods and services are subject to a variety of transforming activities. All these activities have really meaningful benefits. Their logistical benefits are:

- a. Format Benefit (machine processing, heating, cooling, construction, demolishing, etc.);
- b. Location Benefit (obtaining, moving and storing);
- c. Time Benefit (to be available for, have on hand at certain times, etc.).

During production, Format Benefiting activities are performed in the following manner:

- Alteration (processing) of certain materials into other materials (for example crude oil into oil products);
- Construction (assembly) of some semi-manufactured articles or parts (for example the assembly of a vehicle);
- Destruction (for example the demolishing of a ship).

Time and location benefits are received from:

- Transport of goods or services from a specific sender to a specific destination at a specific, intended time;
- Storage of goods and services for a specific time.

Many entrepreneurs think that there is a direct link between production and increased product value, however, the value of an article can only be determined once the client receives it. In order to accomplish this, transport will be required. Although the client may not specifically request it, transport forms an integral part of his needs. Transport may also add substantially to the value of a product.

Storage is another matter. No client will deliberately request a supplier to stock or provide certain products or services. It may look like it sometimes, but in reality the client has expressed his needs without having to wait for the product or service to be provided. However, seeing that the supply of many products and services may be demanded at any given time, and because many suppliers prefer to operate from under one roof, where all the machines and people necessary to produce the article have already been organised optimally, a client will be obliged to wait until the product is ready

for shipment. The company, willing to supply products or services directly to the client as he requires it, will run the risk of keeping these products in stock or to provide these services, on its own. The stock in itself is not actually paid for by the client; except when the product or service has been obtained directly. Storing may have a “time benefit”, but that benefit is of a more commercial nature. Should the company itself not be able to supply directly then its competitor probably will. Keeping any kind of stock always costs money and produces no direct results.

Regarding the aforementioned it is quite understandable why logisticians have such an intense dislike of inventory. Inventory incurs many costs, most of which are indirect. Apart from this, inventory also takes up a large portion of capital invested in the company.

There are many areas in the goods flow that deal with inventory, e.g. raw materials, manual labour, etc. We will discuss inventory in more detail later on.

From our study of the word Logistics it is evident that Logistics covers the *production, assembly and dismantling* of products (and services), as well as the *storage* and the *transport* of the auxiliary materials, raw materials, semi-manufactured articles, products and services.

We have noticed that activities such as alteration, storage and transport occur during the process that we call logistics. A “chain” is used to illustrate this process in logistics.

Seeing that the manufacturing, storage and transport of goods and services are justified (i.e. client demand), this chain should be *controlled*. In other words, a carefully elaborated strategic plan to control the chain should exist. This plan will form the basis according to which the goods flow will be managed on the (work) floor.

It is, however, not only the transport of goods and services to the client that form the logistics of a company. Both trade and production companies should also have a supply of goods and services.

If a trade or a production company feels unsure about supplying adequate amounts of goods and services at the right times, the company will have to compensate for this uncertainty by keeping an ample amount of product, material and auxiliary materials in stock. Even supply deals with stock.

The storage of incoming products is not a big issue for the trade company and they usually combine incoming stock with existing stock ready for supply. In other words: it becomes the same stock.

The production company on the other hand, has at least two types of stock available: inbound materials and auxiliary materials stock, as well as product stock. The production company also accommodates stock for work in progress.

The company- related inbound flow of goods and services should also be controlled.

The controlled supply of products, services, materials and auxiliary materials is called ***“procurement”***.

Procurement includes all the activities relating to ordering, supply, receiving, inspection, planning and information processing, which are necessary for the supply of products, services, materials, etc. to another company.

The controlled manufacturing of products and services is called ***“production”***.

Production includes all the activities involved with the receiving of materials and auxiliary materials, their transformation into products or services, inspection, planning and information processing, in order to offer products and services that can be distributed to the clients.

The controlled preservation of products, services, materials and auxiliary materials is called ***“stock-keeping”***. Stock-keeping includes all the activities involved with the receipt of products, services, materials, etc., the storage, inspection, planning and information processing, in order to offer products and services to production, or for distribution to clients or internally where necessary.

The controlled carrying of products is called ***“transport”***.

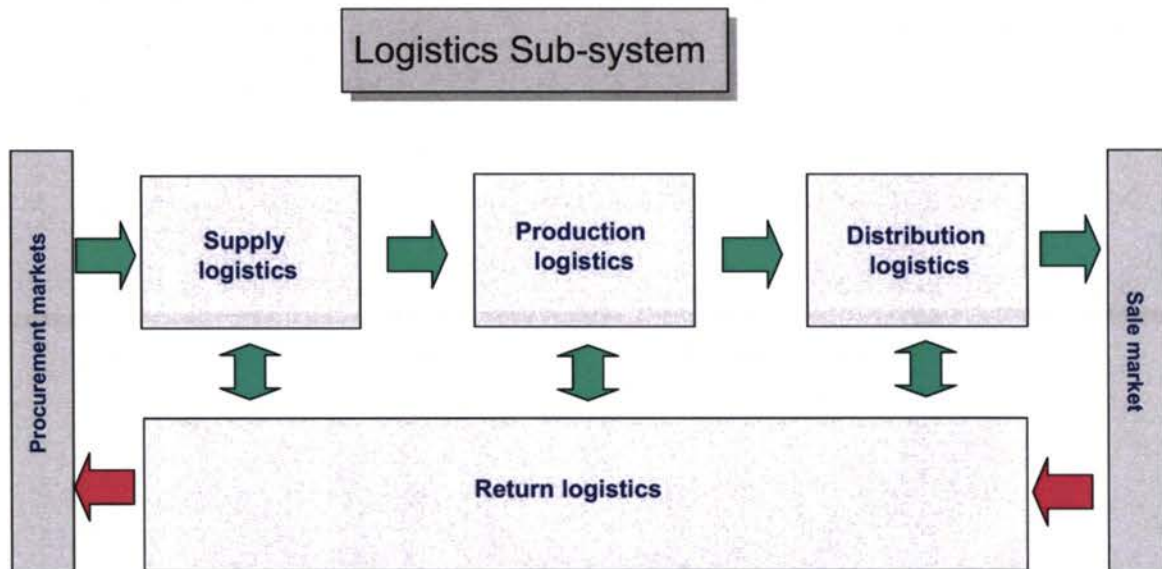
Transport includes all the activities involved with the receiving, loading, carrying, discharging, inspection, planning and information processing, which are required to supply the products, services, materials and auxiliary materials to another company, and the dispatching of products and services to the client.

Another well-known term in Logistics is ***“distribution”***. The word “distribution” is actually used to express the controlled storage and transport of products from the supplier to the client. It differs from “transport” in that “distribution” includes the controlled storage of products and services.

In cases where supplied items (or parts thereof) need to be returned for the following reasons: packing, packaging, superfluous stock, or articles without a money-back guarantee; these activities are jointly known as ***“return flows”***.

Logistic Subsystems are:

- Procurement: *supply logistics*
- Production: *production logistics*
- Distribution: *(physical) distribution logistics*
- Return flows: *return logistics*



Examples

Logistic sub-system	Example	Activities of a logistic service provider (example)
Supply Logistics	Automotive Logistics	Coordination of deliveries of several suppliers as a cross docking station Quality assurance of deliveries Assembling of components JIS- or JIT-delivery of components for automobile production lines
Production Logistics	Steel Plant Logistics	Transport of raw material and semi-manufactured goods between the different production sites within the plant according to the needs of the production process
Distribution Logistics	Foodstuff logistics	Storage and transport of temperature controlled foodstuff between warehouse and shops temperature control for different commodities (e.g. bananas 120C, fish 00C, fresh meat 80C, deep frozen meat 18-210C) warehouse inventory management

		sorting and commissioning of consignments tracking and tracing of consignments delivery to shop shelves
Return Logistics	Recycling of Glass	Collection of waste glass from households and collecting stations Storage, sorting (from metal) and cleaning of glass Transport to recycling factories

Developments in Logistics

Originally logistics merely focused on reducing costs in a company, seeking optimisation of administrative-, warehouse- and distribution processes.

Logistic activities were divided into:

- Materials management, comprising of the procurement of raw materials and the organisation of the goods flows through the production process up to the inventory of finished products. These were merely planning-driven activities.
- (Physical) Distribution Management, organising the flow of the finished products to the clients, including the distribution system, warehouse location / allocation, return flows etc. These activities were more directly driven by the customer orders.

Both sections had their own management tools.

Under the increasing influence of marketing and strategic planning (and due to the rapidly growing number of solutions offered by ICT) logistics has evolved to supply chain management. This is a more integrated approach, looking at chains as a whole, not only within a company, but also between companies active in the same chain.

Supply Chain Management aims to provide the best possible customer service (value) at the lowest possible costs, throughout (parts of) the entire chain from raw material to end user.

Globalisation

“The world has become one global village”. Due to the transition from general cargo to containers, the performance of the transport industry has seen revolutionary improvements. Compared to 1980, the costs per transported product were more than halved in 2004; reliability has increased enormously and processing time has been cut drastically. The increased potential of companies to manage their own industrial processes, especially their supply chains, assisted by ICT, also presented the opportunity for *distance* management.

While the container has converted the physical part of the supply chain into world-encompassing unity, the Internet has done the same for its informational requirements. As a result, companies are recalling their

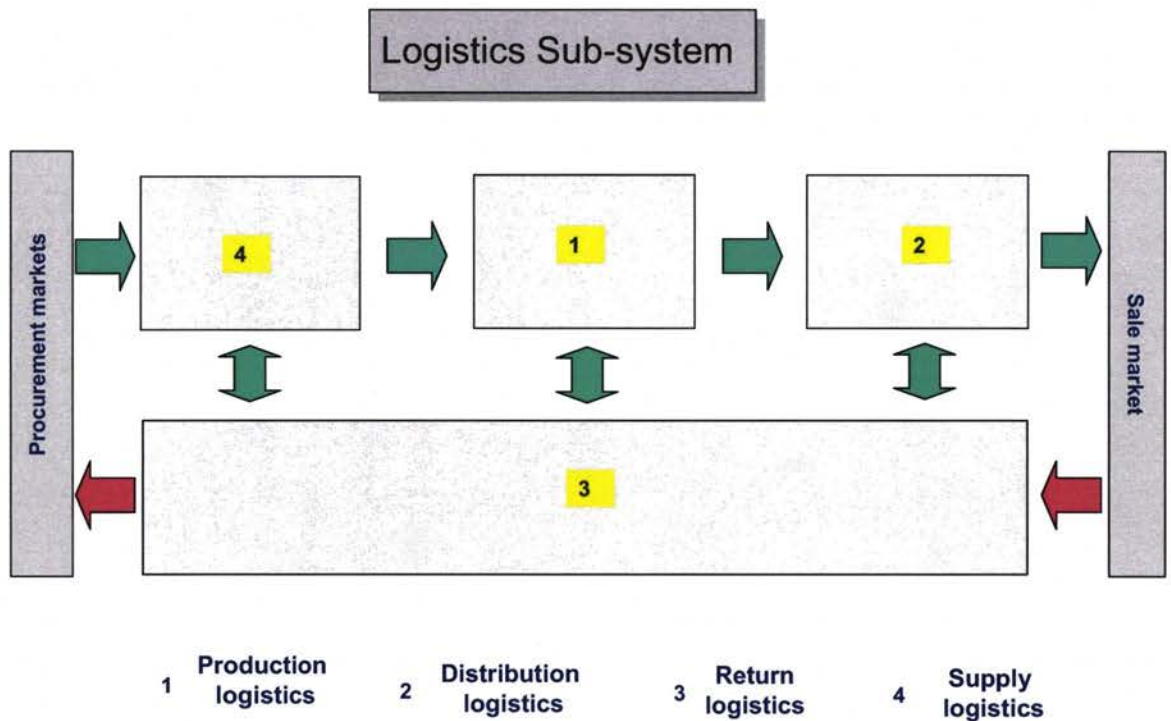
production/factories from areas with high labour expenses and relocating. No matter what the political, economical and environmental implications may be for the forwarder, these developments, referred to as “globalisation”, present unprecedented opportunities.

Test Questions

Please decide if the following are true or false:

- Logistics covers planning, implementation, handling and control of flows of goods, services, people and information. (true)
- The operating responsibility of logistics is the geographical repositioning of raw materials, work in process, and finished inventories where required at the lowest possible cost. (true)
- Logistics is a part of logic and can be considered as science of coherence of ideas. (false)
- Logistic can be divided into four sub-systems . (true)
- Logistic can be divided into five sub-systems. (false)

Please place the names of the elements of the logistic sub-system in the correct order:



9.2 Outsourcing and tendering

Learning objectives:

The student should be aware of outsourcing opportunities for logistic service providers and be able to explain the main activities in an outsourcing process.

“Outsourcing” originates from “Outsider Resource Using” and describes the transition from using privately owned resources (e.g. lorries, warehouses of a production company) towards contracting services from outside providers (e.g. forwarders, common carriers, warehouse operators). The trend for the increasing use of outsourcing provides many interesting opportunities for forwarders as logistic service providers.

During the past few years, many companies have started to outsource activities and are starting to focus on their core activities, meaning a number of specific logistic duties will also be outsourced. This endeavour is not limited to transport, but can extend to such a degree that even a portion of the production activities will be outsourced. The decision to outsource however is not an easy one for shippers to make.

During acquisition, the logistic service provider, including the professional freight carrier, should be acutely aware of the shippers’ reservations regarding the outsourcing of distribution services. In most cases, tariffs are the most important consideration for shippers. The ability to provide additional services may become a valid argument when a professional carrier, who provides these services as a rule, is considered.

When the shipper cannot decide whether to outsource or not, there are a number of aspects to take into consideration that may provide assistance with the decision. These considerations are:

Costs

An important reason for outsourcing logistic activities is cost. In many cases, the scale on which the distribution department of a company is operated is insufficient to compete with the prices of a professional tender for logistic services. A shipper will compare the calculated costs, although ideally all costs relating to the provision of logistic services will have to be taken into consideration, an insight which is unfortunately still lacking

Available Capacity

To implement logistic activities, a considerable amount of investment is sometimes required. The shipper may simply not have enough capital at his disposal, or may be unable to raise enough money to invest in a logistic system. Under these circumstances a shipper will be obliged to outsource some of the logistical activities.

Quality

The quality of logistic activities may present more problems to the shipper. Due to the fact that the shipper has no specialised knowledge of logistic activities, he can hardly compete with the level of quality offered by the professional logistic service provider. The shipper may also feel that the logistic service provider doesn't share his ideas on quality. This uncertainty may cause the shipper to be on his guard when it comes to outsourcing logistic activities showing a more emotional than a calculated reasoning.

Available Knowledge

When a shipper has to make a choice, a very important aspect is the amount of knowledge available in the field of distribution. Many companies feel that the distribution of products is not part of their core activities and for this reason, inadequate attempts are made to acquire the knowledge needed; in some cases not at all. Once a company has decided not to commit to a number of activities, perhaps due to the current state of the employment market, will be outsourced. The tendency to outsource, due to a lack of knowledge, is increasing.

Manageability

Apart from the influence it has on the nature of the target market and the product, the lack of knowledge has an additional, rather damaging consequence; i.e. the manageability of distribution. Distribution can become so complex that specialised knowledge will be required to manage it. When this happens, shippers also tend to outsource distribution.

Risk

Greater complexity leads to more risks, which the shipper is often not prepared to take. If the shipper wants to avoid the threat of risk, he/she will do so by outsourcing high-risk distribution activities.

Available Capacity

Distribution requires not only knowledge but also transport capacity. There are various companies that have their own freight trucks (combinations) or semi-trailers and/or tractors and obviously want their vehicles used to maximum capacity. When the amount of products to be distributed varies constantly, this will lead to situations where the transport capacity will be inadequate some of the time and superfluous at other times. Companies who do their own transport will prefer to keep their own transport capacity down to a minimum and would rather rent the additional/temporary capacity that may be required. The same goes for storage capacity.

Secrecy

A commercially operating company will aim to keep its customer database secret from the competition. Once the competition finds out that similar companies are not totally convinced of their customer database's protection, they will want to perform the distribution themselves. A matter that should be of the utmost importance to the logistic service provider is the guarantee of total secrecy for shippers.

Identity

The trade or the brand names of companies should be displayed to the public as often as possible. When vehicles are employed to display trade and/or brand names, they are seen as mobile advertising-pillars. Existing clients usually find a vehicle bearing the trade name proof of positive contact with the supplier which may motivate the company to acquire its own fleet of vehicles, instead of employing those of professional carriers. If cooperation between professional carriers and the shipper is intense, an agreement may be reached which will allow the trade name of the shipper to appear on the vehicles.

Service

The ability to offer additional services to the client is the third reason why shippers prefer to control their own distribution activities. The services may vary from tracking and tracing (i.e. following the progress of shipments during distribution), to the employment of co-workers in the warehouse, and a driver at receiving who will deal with complaints as well as other, more commercial, activities.

A logistic service provider could provide a similar service. In order to accomplish this however, a good relationship would need to exist between the shipper and the logistic service provider.

91% of all enterprises expect cost reductions through outsourcing, 67% expect better service, 60% expect more flexibility and 58% try to avoid necessary investments. (Baumgarten, TU Berlin 2000)

Outsourcing of Logistic Services	Pro	Contra
Economics	Reduced costs Pay what you use Less capital tied up Increased cash flow	More communication More administration
Management	Focus on core business No staff or assets Costs more explicit	Labour redundancy Confidentiality Less customer contact Loss of expertise
Operations	More flexibility Access to innovation	Specific experience Damage risk Less direct quality control

Test Question 9.2:

Please decide if the following are true or false:

- Focusing on core activities within a company results in a few specific logistic duties being outsourced. (true)
- The main argument pro outsourcing is an increase in price. (false)
- Tendering is a process in which an organisation seeks quotes for a particular project to be carried out by a contracting logistic service provider. (true)
- To avoid unnecessary investment for non-core activities may be a reason for production companies to outsource transport and warehousing. (true)

9.3 Quality Management

Learning objectives:

The student should be aware of the term quality in logistic services, of the ISO-standards, of the Quality Management System.

According to the ISO-standard 8402 (ISO = International Standard Organisation):

“**QUALITY** is the entirety of characteristics of one unit relating to its ability to fulfil determined and provided requirements.”

With other words: Quality is; if all requirements concerning each unit of a product or service produced are fully met.

This is independent from the level of service, e.g. 1st or 2nd class train ticket. Quality is possible at both levels if the specific requirements of the class are met.

The concepts of how to assure and to manage quality have undergone certain stages of development:

Quality assurance = Quality inspection at the end of the process (e.g. assembly line);
traditional form, very expensive; in transport not possible

Quality management = Proactive management of all resources and processes which are relevant for producing quality, internal audits

Business excellence = Generic focus on quality, not only on products, but also on financing, customer and employee satisfaction, self assessments

Aims

- satisfaction/enthusiasm of all stakeholder
- superiority in the competition
- best practice
- enduring success
- customer satisfaction
- proactive error prevention
- permanent improvement
- quality of the final product
- No cull
- fulfillment of the requirements

Focus

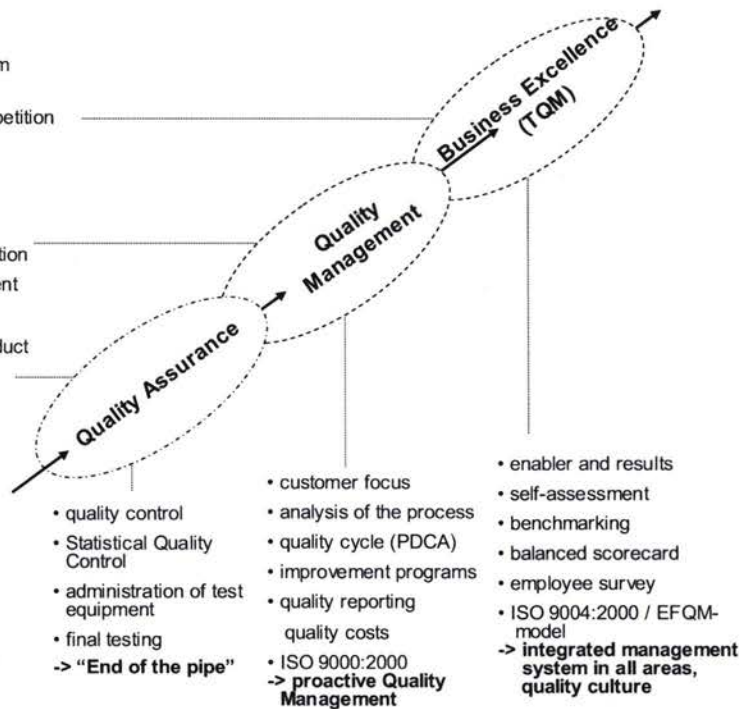


Chart: Development of quality management (source: Wagener&Herbst, Potsdam)

The ISO 9000 stands for worldwide recognized standards of the ISO on “quality management systems” in all kinds of enterprises and organizations. The ISO 9000-norms are a set of international quality management systems and guidelines. The first version of these norms was published in 1987 and in 1994 the possibility of certification were added to this standard. In the year 2000, the ISO-norms were reviewed anew and another set of norms, which is currently known as ISO 9000:2000 were launched.

The set of ISO standard consists of:

- ISO 9000:2000 Quality management systems. Fundamentals and terminology.
- ISO 9001:2000 Quality management systems. Methods and requirements.
- ISO 9004:2000 Quality management systems. Methods to improve performance.

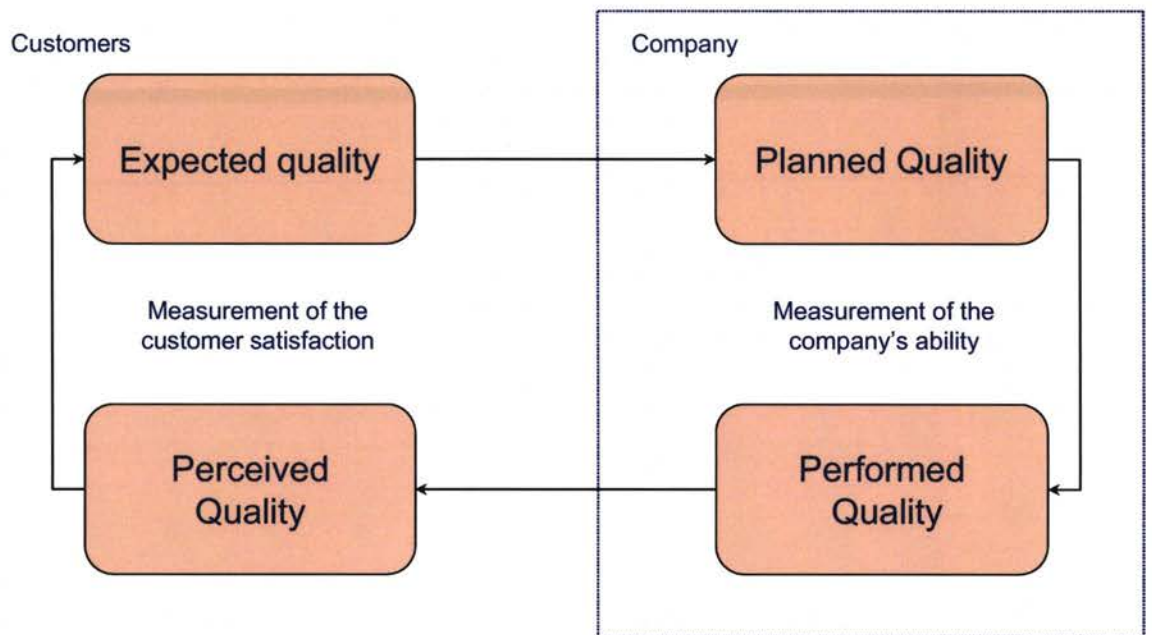
The most significant of the ISO 9000:2000-norms are ISO 9001 and ISO 9004. These norms deal with quality management over the course of five chapters, i.e.:

1. quality management systems;
2. management responsibility;
3. personnel management;
4. production management;
5. measuring methods, process analysis, and its improvement.

See also www.iso.org

Quality can be considered as a cycle which must be ensured through quality management, driven by the clients requirements and perceptions.

The quality circle

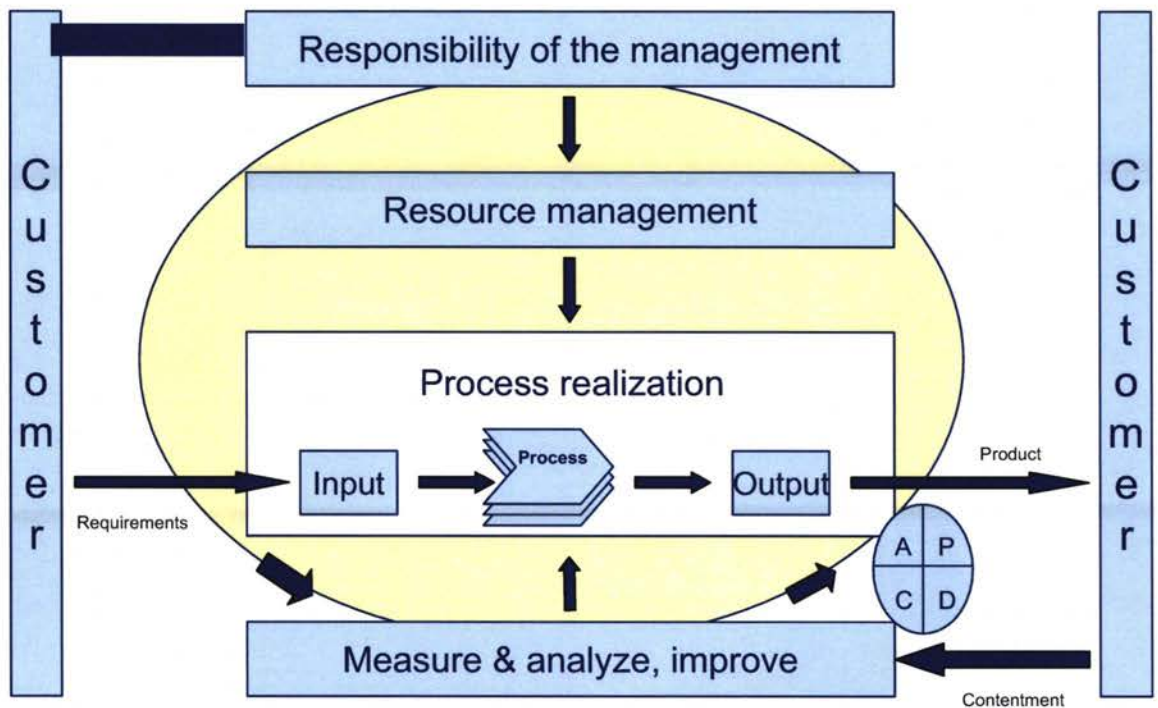


Quality Management is the part of business management that fixes the quality policy and the quality-relevant functions, responsibilities and competencies in the company and realises them by

- quality planning
- quality control
- quality inspection
- quality improvement

within the scope of an Quality Management System.

Model of a process orientated QM-System (ISO 9001:2000)



For information about audits of QM-System please read the following:

Audits

Regular follow-ups should be done to find out whether the company is adhering to the requirements, as specified. These follow-ups are called an "audit". They may occur either as:

- internal audits, in which case the company will launch its own investigation to find out whether all departments and officials still adhere to the specifications as set out by the quality management system;
- external audits, in which case the ancillary suppliers are investigated to establish whether they are still adhering to the specifications as set out by the ISO 9000:2000;
- external audits, in which case an independent certification company will investigate whether a company still adheres to the quality demand specifications.

In order to retain the certificate of approval, a similar extrinsic audit should be performed at least every six months.

It could prove to be a wise decision to involve the assistance of experts right at the start of an introduction, mainly because the entire process is quite complicated, but also because a lot of work will need to be accomplished during normal working hours.

A number of specific subjects are described in the ISO 9000:2000, with which companies should comply in order to qualify for certification.

ISO 9000:2000 for Transport

If a company wants to set-up a quality management system, the full support of its management towards this endeavour will be extremely important. Management can validate their support by issuing a declaration that will verbalise the goals of its quality policy. Additionally, management will have to appoint a quality manager who will be allowed adequate time and facilities to perform his duties well. Management will also have to stipulate the duties, responsibilities and capacities of the quality manager very clearly.

The quality manager should be allowed to have a more independent and distant position. This means that the quality manager should not be expected to perform other managerial duties that could influence the quality. Besides, the quality manager should have direct access to higher management and should report to them regularly as well.

According to the ISO 9000:2000-standards, management should share the direct responsibility for the development and the maintenance of quality with the quality manager. This implies, amongst others, that the top management of a company should see to the frequent development, introduction, improvement and revision of the quality management system.

The Quality Manual forms the documentation of the quality management systems.

An important aspect of the quality management is the company's attitude towards contracts. This includes the basis on which contracts are judged, as well as the conditions conducive to its acceptance, execution and administration. In the quality management system the manner in which legal, commercial and interval documents are engaged, as well as documents from the client, documents to accompany vehicles and drivers should be scrutinised. The approach towards the satisfaction of legal demands should also be specified clearly.

The quality management system will have to give some thought to the way in which the procurement of services and such is done. For the forwarder this will include hired transport services, storage facilities and the irreplaceable mediums of communication. An indication of how and why a pencil was obtained won't have any significance to this case.

The ISO concerns itself with the products and services as specified by the client. This may involve preparation of the load and execution of or assistance during loading and discharge. Administrative duties may be required as well. All these activities should be included in the quality management system.

A strategy should be prepared for the identification and tracking of a load, in other words, the administration and the archiving of documents should be organised and arranged in such a way that it will enable effective tracking and tracing.

All relevant work procedures and instructions should be determined and maintained. This applies to the entire calculation stage – from accepting a project, through execution up to invoicing, claim processing and costing.

All conditions that apply to a project, including the activities that go with it, should be added to these procedures and instructions.

Claims from clients form an integral part of the quality management system. This implies that the manner in which claims will be registered, settled and prevented in future, should be very well organised. The conditions that apply to the honouring of these claims also belong to that part of the quality guarantee.

All documents relating to the execution of orders, including those documents that usually accompany the load, means of transport and the driver, should be registered and archived.

Regular follow-ups should be performed to find out whether the quality management is still valid and that it is adhered to adequately. This can be accomplished by an “audit”. This audit can be performed internally, but a regular audit by an independent, capable body may be necessary. This should be arranged within the quality management system.

The quality management should consider training for the employees. Of main concern in this case are the drivers, but the support staff (e.g. planners) and the relevant managers should be involved as well. It might be a good idea if these employees could arrange a training plan and stick to it.

The employment of statistical techniques to monitor the effecting of orders, and the consequent adjustment of norms for the calculation and planning of future orders, should be applied to the transport industry as well.

Documentation of a quality management system

The Quality Manual is a very important document for the quality management of a company. This manual should meet the following requirements:

- it should comply with the specifications as determined by the ISO;
- its contents should be user-friendly, i.e. all co-workers in the company should be able to read and understand it quite easily;
- it should have a loose-leafed format, to allow for modifications.

The Quality Manual contributes significantly to the value of a company's quality management documentation. It consists of the following documents usually:

- Quality Management Handbook → for external use
- Quality Management Procedures → for internal use, describe companies functions and procedures
- Work Instructions → for internal use, describe specific instruction for work places
- Inspection Instructions → for internal use

Test Questions

Please decide if the following are true or false:

- Quality is the degree to which a product or a service accommodates consumer requirements. (true)
- The Quality management fixes the quality policy and the quality-relevant functions, responsibilities and competences in the company. (true)
- The ISO 9000 primarily stands for "employees motivation". (false)

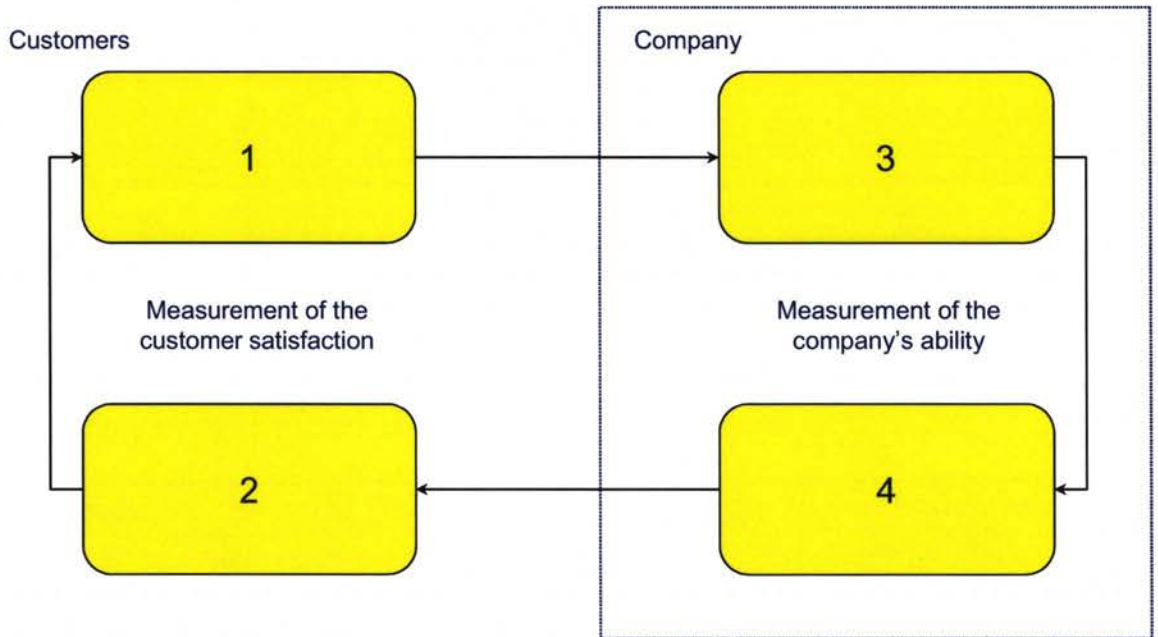
The ISO 9000 system provides standards for:

- W Quality levels in a company
- W Optimal logistics equipment and systems
- R Quality measurement / management procedures

In order to retain the ISO quality management certificate of approval, external audits should be performed at least every:

- W 3 months
- W 6 months
- R 12 months
- W 36 months

Please fill in correctly:



1 Expected quality

3 Planned Quality

2 Perceived Quality

4 Performed Quality

9.4 Logistics Concept / Project

Learning objectives

The student should understand which actions and which phases build a logistics project.

The student should understand how a logistics project can be effectively evaluated.

Phased approach

In many cases Logistic activities can be regarded as a project.

A project is in principle a (one-time) group of actions performed to achieve a certain goal.

One example is the outsourcing of storage to a public warehouse. Before a suitable offer can be issued to the client and this can be implemented, many issues must be carefully analysed and prepared. To organise this properly, a phased approach is advisable.

Generally the following project phases can be distinguished:

- Problem definition
- Design
- Realisation
- Aftercare

Problem Definition

In this phase an analysis is made of the actual situation and the problems / bottlenecks experienced in the current situation. This also includes a description of the goals which should be achieved by the project: cost reductions, improvement of service levels etc.

In logistics projects extensive data must be collected on the following:

- inbound / outbound goods flows, taking into account seasonal fluctuations and future projections
- numbers of items to be stored
- technical requirements of the goods to be handled / stored
- actual buildings, equipment, facilities etc.
- actual costs, staff numbers
- actual service levels

Secondly all relevant starting points and preconditions to the project need to be listed.

One vital precondition is: what is the (commercial) strategy of the client? What is his market vision regarding clients and long term objectives? The solution which will be offered should of course be in line with this strategy. Preconditions could also include a maximum investment, location restrictions, minimum service levels etc.

The project organisation will also need to be mentioned: project manager, team members, structure for communication, progress control, financial controlling, reporting etc.

It is good practice to conclude this phase with a report which should be approved by the client, to ensure that all parties share the same vision on the project.

Design

In this stage a solution is prepared for the problems, objectives and starting points analysed in the previous phase. In more complicated projects a number of alternative solutions (scenarios) may be prepared with different options for material- and information flows, equipment and systems. The alternative scenarios will provide a preliminary sketch and not in full detail; calculations and elaborations provide the level of detail required to make the

right selection in terms of investments, operational costs, achievable service levels etc. this is called the preliminary design.

The alternative solutions will be presented to the client who will decide what the most favourable option is (in line with his commercial strategy).

The preliminary design of the selected option will then be further detailed in terms of e.g.

- organisation
- equipment, lay-out & routing
- working methods
- budget, investments, operational costs
- implementation activities & planning

The detailed design phase will be terminated with a report, including a detailed implementation plan, to be approved by the client.

Realisation

In this phase the selected scenario will be implemented. Depending on the situation this may include activities such as:

- construction of a new building
- procurement, installation and testing of equipment
- adaptation of organisation, procedures, working methods
- staff (de-)recruitment, training

The realisation phase will be terminated with a report (mentioning possible deviations from the original objectives etc.), approved by the client.

Aftercare

After implementation the project will be evaluated.

The evaluation includes not only a one-time activity concerning the project itself (the final results related to the initial objectives, the final project costs related to the initial budget etc). Aftercare should also comprise performance management, which is a continuous, repetitive process of comparing of costs and service levels with objectives and making adjustments where necessary.

This can be achieved by implementing the performance management cycle:

- determining a requested performance level for each relevant activity;
- defining performance indicators to quantify the requested performance levels;
- implementation of procedures and tools to measure the realised performance;
- comparing the real performance with the performance indicators;

- determining corrective actions, in case the realised performance does not meet the performance indicators.

Project Organisation

A proper project organisation consists of:

- an internal or external client, who require the project results and with whom the measurable goals (deliveries) should be agreed
- a project manager who is responsible for achieving the goals and who has the competency to decide on resources (budget, input)
- a project plan with definite work packages and milestones (i.e. dates at which definite deliverables must be presented)
- a project team consisting of experts and in some cases contractors.

week date*)	week 1	week 2	week 3	week 4	week 5	week 6	week 7	consultant days
	14.-20.08.	21.-27.08.	28.08.-03.09.	04.-10.09.	11.-17.09.	18.-24.09.	25.-30.09.	
WP 0								2
WP 1								5
WP 2								2
WP 3								6
WP 4								9
WP 5								15
WP 6								18
WP 7								8
Total								65
Milestones	kick-off			Presentation of location & capacity plan			Presentation of feasibility study	
	14.08.2006			08.09.2006			30.09.2006	

Example: Project Plan with Work Packages and Milestones

Test Questions

Please decide if the following are true or false:

- Problem definition, design, realisation, aftercare are typical steps of a logistic project. (true)
- The problem definition also includes a description of the goals which should be achieved by the project: cost reductions, improvement of service levels etc. (true)
- In the step ‘design’ an organisation decides about the design of new building. (false)
- A project is a certain form of a long term, stable company organization. (false)
- A project may never end. (false)

9.5 Physical Distribution Systems

Learning Objective
 The student should understand the different categories of logistics service providers, related to the level of outsourcing and related to the range of services offered.

9.5.1 Level of Outsourcing

Learning Objective:
 The student should understand the different categories of logistics service providers, related to the level of outsourcing.

Outsourcing is performed in relation to a certain decision level (strategic, tactical, operational).

The options are specified in the table below.

	Strategic	Tactical	Operational
	System design, tendering, judging	Chain management, Forwarding	Execution, Ownership of logistic assets
1PL	Shipper	Shipper	Shipper
2PL	Shipper	Shipper	Carrier, person in charge of warehouse
3PL	Shipper	Logistic service provider → Forwarder	Logistic service provider and/or subcontractor
4PL®	Consultant, facilitator	Logistic service provider → Forwarder	Logistic service provider and/or subcontractor

N.B. 4PL® is a trademark of Accenture

- 1PL: all activities are performed under own management.
- 2PL: the shipper only out sources certain specialised operational activities.
- 3PL: a (large) logistics services provider takes over all tactical and operational activities (specialised services, e.g. transport or warehousing, may be outsourced by him to a third party; the shipper remains in charge of the strategic issues.
- 4PL®: all activities are outsourced; a “facilitator” provides strategic solutions and contracts one or more 3PL providers.

The facilitator does not necessarily own logistics assets; and could be a consultant, having comprehensive knowledge of the transport market and appropriate computerised analysing tools. He could contract the 3PL parties at his own or the shippers’ risk.

With regard to 4PL® the following can be determined:

Advantage: an independent party, capable of offering a selection of services which would be the most favourable for the *client* (it has often been speculated that 3PL companies offer solutions which merely optimise the utilisation of their own assets).

Disadvantage: without having assets it would be more difficult for the 4PL® party to manage operations and to control performance and service levels.

Test Question 9.5:

Please Link

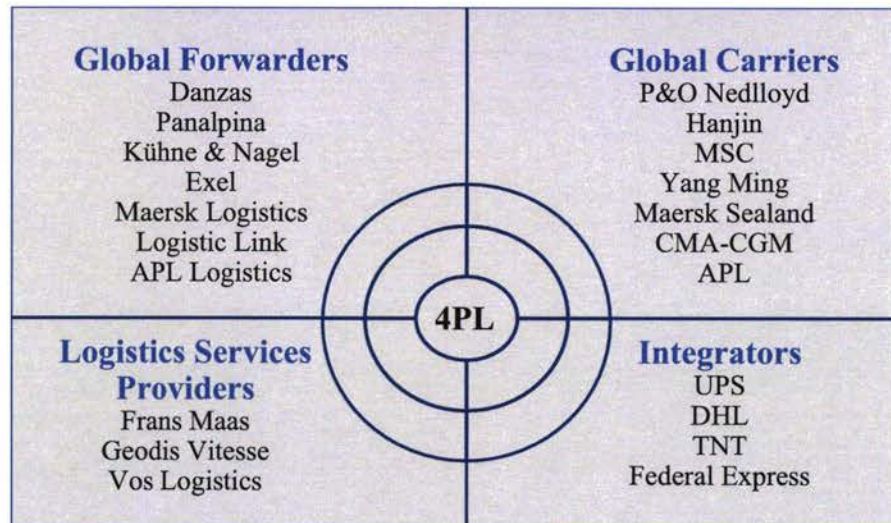
Move	Fix
1 PL	all activities are privately managed.
2 PL	the shipper only out sources certain specialised operational activities.
3 PL	a (large) logistics services provider takes over all tactical and operational activities (specialised services, e.g. transport or warehousing, may be outsourced to a third party; the shipper manages the strategic issues.
4 PL	all activities are outsourced; a “facilitator” provides strategical solutions and contracts one or more 3PL providers.

9.6 Range of Services

Learning Objective:
 The student should understand the different categories of logistics service providers, related to the range of services offered.

A second distinction can be made according to the services offered. Some examples are mentioned in the following illustration.

- forwarders: offering world-wide logistics solutions, integrate different means of transport
- carriers: road hauliers, rail operators, shipping lines, airlines, warehouse operators
- Logistics service providers: offering comprehensive logistic solutions, specialized on a certain branch or customer, including transport, warehousing, VAL etc.
- Integrators or system providers: focusing on world wide parcel distribution, applying different transport modalities (air, road etc.), very standardized services



Test Questions

Please decide if the following are true or false:

- Global forwarders offer world-wide intermodal transport solutions. (true)
- Logistics service providers are providers of logistic solutions for specific clients, e.g. for the automotive industry, foodstuff industry etc. (true)

- Integrators are system providers focusing on world wide parcel distribution, applying different transport modalities (true)
- UPS, TNT, DHT are typical examples of unimodal carriers. (false)

9.7 Subsystems in Logistics

Learning objectives

The student should understand the various logistic subsystems and their interrelations in companies.

The student should understand the characteristics of supply chain management.

The student should understand the difference between planning- and order- driven logistics, as well as the various customer order decoupling points.

The student should understand the main customer service issues in logistics and how they are managed applying service level agreements and key performance indicators.

9.7.1 Subsystems

Learning Objective

The student should understand the various logistic subsystems and their interrelations in companies.

A few of the operational functions that form part of a company's logistics are quite familiar. According to the order in which goods flow passes through a company, they are:

- the supply and receipt of products, materials and auxiliary materials;
- the storage of materials and auxiliary materials (only done at production companies);
- the transformation (production and assembly) of materials into end products (only done at production companies);
- the storage of end products;
- the distribution of end products.

A brief discussion of all these operational functions, which jointly form the supply chain, will follow shortly.



Fig. 1.1: The operational activities in a production company

The supply and receipt of products, raw materials and auxiliary materials

The first operational function that we will encounter in the goods flow, as the title of this sub paragraph may suggest, is the supply and receipt of products, materials or auxiliary materials. "Materials" refers to all raw materials, semi-manufactured articles and information that a company needs to produce and trade its products.

In many cases, the receiver of the materials has nothing to do with the supply itself. Many suppliers will dispatch their products carriage paid. In other words: all costs and planning concerning the supply is the supplying company's responsibility; or it should be performed by a logistical service provider on behalf of the supplying company. However, when other conditions of supply have been agreed upon, for instance FOB or Ex Works, the receiver will have to share the responsibility of planning and paying for the supply.

A company will be involved with the supply of materials as a matter of course. This is mainly due to the fact that the company has indicated during procurement that it requires products, materials and auxiliary materials. Not surprisingly, the responsibility for this operational function rests with procurement.

The storage of raw materials and auxiliary materials

In many cases raw materials and auxiliary materials cannot be processed directly and therefore require a certain amount of storage time. The question of where and how something should be stored must be directed to the warehouse. The warehouse will have to guard the raw materials and the auxiliary materials "like a good house master" and should store it in such a manner that it will ensure immediate availability. Additionally, the warehouse will have to perform the inspection of the inbound materials and auxiliary materials itself, with the cooperation of procurement.

Although procurement is responsible for the inspection, technically speaking, this function is often performed by the receiving department of the warehouse.

The procurement department generally determines the amount of stock to be ordered, and then issues the orders according to the requirements as submitted to them by the production department. Accounting or management will also want to have their say in the matter. All stock, including materials and auxiliary materials, represents quite a large portion of invested capital. And with capital being a scarce commodity, the accountants will see to it that stock levels do not get out of hand.

The transformation of materials into end products (Production)

The transformation of materials and services into end products is a very complex activity that needs a lot of attention. Transformation may comprise alteration, assembly or dismantling. Transformation may involve other activities as well, e.g. repairing, servicing, installation and adjusting.

Logistics is not primarily interested in the physical transformation process itself, but more in the proper organisation of the related flows of goods through the transformation process.

In general, a trading company does not store raw materials, nor their transformation. Still, many trade companies do have a certain type of “transformation” process going, which can also be found at production companies, namely: packing and unpacking; internal transport and information gathering. Although packing, unpacking, stapling and labelling do not count as official activities from a production perspective, the complexity still compares favourably to that of the production company’s transformation process. It is not surprising to find that most trade companies are familiar with production problems.

The storing of end products

In both production and trade companies the actual moment of end product availability and the moment of delivery to the client will almost always be different. The end products are usually stored until the appropriate moment. Once again, it is the responsibility of the warehouse management to store the end products and to see to their rapid dispatch. In the warehouse of a trade company, the receipt of products will be supervised by the procurement department; dispatch is part of sales’ responsibilities. Dispatch usually starts with an order that is issued to the warehouse, indicating the type and amount of end products that are required by the client, as well as the expected time of delivery.

To determine the stock level of end products, both accounting and client requirements should be considered.

Dispatch and distribution of end products

A function that is significant for the logistic service provider in general and for the forwarder specifically is the dispatch and distribution (in logistical context, i.e. physical distribution) of the end products. It is worth noticing that the logistic service provider will perform exactly the same function during the supply to the destination or client. The supply to and the receipt of goods at the destination is closely related to the dispatch and distribution stage of the supplying company. Most of the time the supplying company

will plan the progress of the dispatch and distribution process itself, whilst being aware of the fact that all risks involved will be on its own head. In this respect the professional carrier of the goods may contribute significantly to the quality of the supplier's customer service.

The operational management of dispatch and distribution is organised by the distribution department; or the "shipping-department" of a company, as they are often called.

(See Figure 1.1)

Test Questions

Please decide if the following are true or false:

- The responsibility for supply of goods depends on the terms of payment agreed between the seller and buyer. (false)
- The logistical solutions for the supply of goods are closely connected with procurement. (true)
- The amount of goods stored in warehouses represents considerable capital in stock and should be kept to the bare minimum using intelligent logistic solutions (e.g. just-in-time-delivery). (true)
- Production logistics deals with the proper organisation of the related flows of goods through the transformation process. (true)
- The forwarder is responsible for the material flow between the different machines and working groups within a factory site. (false)
- Dispatch and distribution of goods is within the responsibility of a shipping department usually. (true)

9.8 Logistics and Supply Chain Management

Learning objective:

The student should understand the characteristics of supply chain management.
The student should understand the difference between planning- and order- driven logistics, as well as the various customer order decoupling points.

Efficient and effective logistics in a company can only be achieved when compromises have been made between the different functions in the chain. The way in which all activities in a company, depend upon each other is clearly illustrated in Figure 1.1. Until 1990, this was what **Logistics** was all about: to achieve the optimal performance of the goods flow within a company.

Effectively optimising goods flows *between* companies is the essence of **Supply Chain Management**. Since 1990 there has been an obvious cooperation in the logistical planning between company groups, and in almost every type of industry. Long before 1990 significant standardisations

had already occurred in some chains, but not to such an extent that it could influence the whole chain.

Computers have been in existence even longer, but it was the arrival of more heavily standardised systems and other tools (e.g. the barcode) and in particular the introduction of Internet, that had a major impact on the development processes of the supply chains.

Planning- and order driven chains: the decoupling point model

The decoupling point model was developed by Philips in The Netherlands, at the end of the seventies and the start of the eighties of the previous century. In order to gain more insight into the functioning of the goods flow, Philips was selected as the brand of choice.

This model starts based on the assumption that there are two parts of a goods flow through an organisation, i.e. a goods flow that is managed according to a specific plan, followed by a goods flow driven by orders (customer- or internal orders).

Depending on the nature of the product, the production method, the desired cost price and client or consumer demands, the planning-driven goods flow phase may be shorter or longer, or it may be totally absent, or the whole process in the company may be planning-driven.

The decoupling point is where the planning- driven goods flow changes into the order- driven goods flow. Consequently, five different decoupling point positions are distinguished.

To manage a goods flow, a clear distinction should initially be made between a plan-driven and an order-driven goods flow.

An **order-driven goods** flow occurs when the issue of an order puts the whole process in motion. It may be an order from a client or an internal order. The ordered goods are actually “pulled” through the chain by the entity that submitted the order.

An order-driven goods flow has the following advantages and disadvantages. The most important advantage is that the requested goods can only be delivered to one location at a time. No stock needs to be kept with the receiver.

Stock keeping at the receiver will only be required as a direct result of the quantity that was ordered which depends mainly on the manner in which it will be transported. It may not be practical to request a courier to do daily deliveries to a specific address when weekly shipments with a cargo truck may prove to be less costly. One should however bare in mind that stock

keeping incurred by weekly deliveries may lead to costs that have the potential to rise above those of daily deliveries.

Another important advantage of the order-driven goods flow is that it enables the company to react directly to a customer's order. Delays, due to the fact orders not being planned, will not occur as often as with plan-driven goods flows.

One disadvantage of the order-driven goods flow that shouldn't be overlooked is the relative unpredictability of the daily inflow of goods. Fluctuations in the flow may occur. The system should have the necessary capacity to accommodate this situation and the capacity should be such that it will be able to cope with situations where the goods flow might expand to the maximum (required) quantity.

As a result, the warehouse will run out of stock when the goods inflow is smaller, which implies that the capacity will not be utilised to its optimum. Consequently production, storing and transport facilities, as well as all other, related facilities that are required to manage these activities, are never fully utilised.

The most important characteristic of a **plan-driven goods flow** is that the activities do not depend on individual orders, but that they are planned based on a forecast. All the activities are directed and performed according to this plan. The manufacturer will produce and push the goods through the chain, subsequently.

An important advantage of a plan-driven goods flow is that, if a relatively accurate demand forecast can be made, it will allow the growing nature and quantity of the goods flow to be met adequately and efficiently on the short and even medium term and that the system's capacity can be adjusted accordingly.

Through effective management of the goods flow in the medium term, real fluctuations concerning demand may be limited by spreading the consequences that fluctuations have on demand (increases and reductions in the average demand) over a longer period of time. As very few fluctuations will occur in the nature and quantity of the plan-driven goods flow using this type of management, the capacity of the system will still, with the exception of a controllable safety margin, be fully utilised.

One disadvantage of the plan-driven goods flow is that the possibility of a sudden increase in the goods flow, except for those already forecasted, cannot be handled. The nature of the goods flow (for example end product type) has also been predetermined showing that there is very little flexibility present in this system.

In practice, both the aforementioned management styles should form part of all supply chains. Assumptions are made that supply logistics is plan-driven ensuring that the capacity required for the acquisition of raw and auxiliary materials, as well as the production of end products, will be fully utilised.

With distribution logistics the goods flow is mainly order-driven. Quite a lot of effort is exerted to ensure that the flow of end products to the consumer remains dependent on the consumer's needs which from a commercial point of view could even be considered essential. There may, however, be other divisions where larger or smaller portions of the goods flow may be plan- or order- driven. These divisions in the plan- or the order-driven goods flow, which occur inside the boundaries of a supply chain, are known as 'decoupling point positions'.

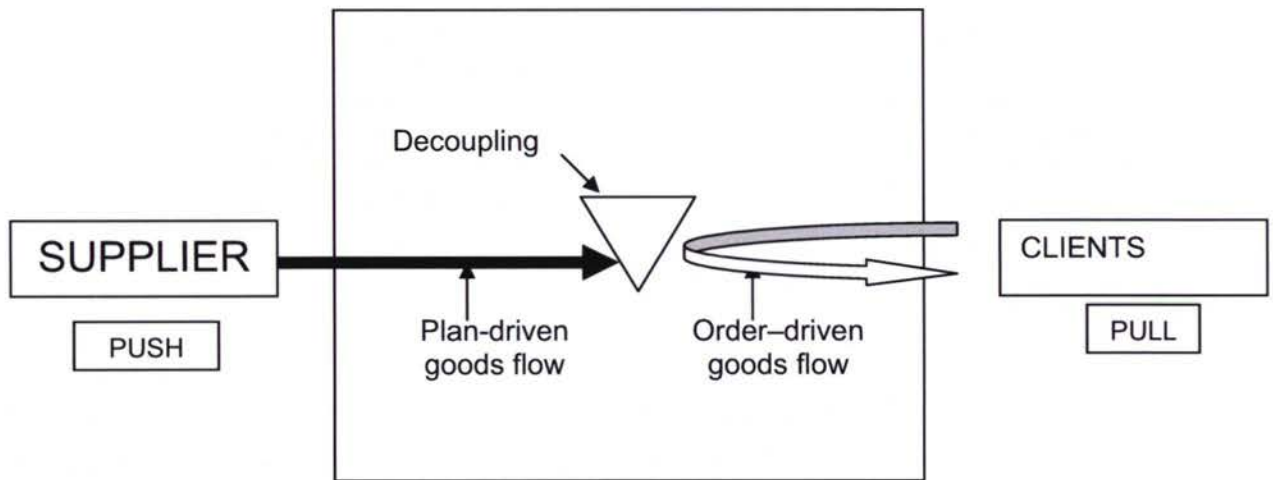


Fig. 1.3: Splitting the goods flow into a plan-driven (PUSH) and an order-driven (PULL) goods flow.

Location of the Decoupling Point

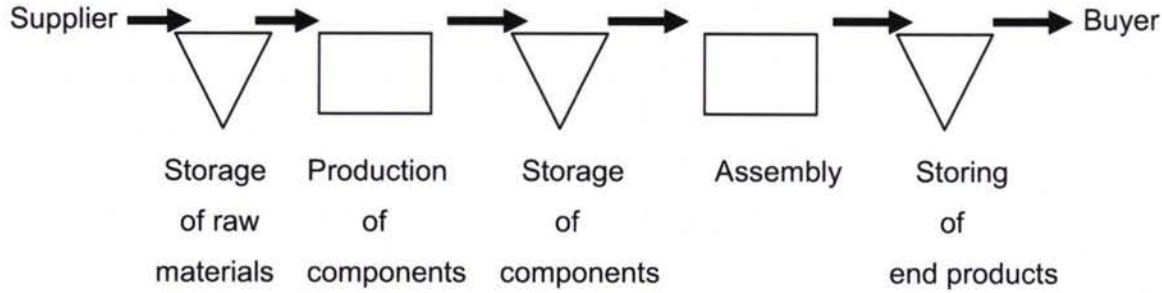
Eventually it will become clear that a direct connection between a plan-driven goods flow and an order-driven goods flow will only be possible once the nature, the quantity and the frequency of both goods flows have been synchronised. If not, differences may lead to shortages in the order-driven goods flow (when the actual demand exceeds the actual capacity of the plan-driven goods flow), or to an accumulation of materials or products (when the actual demand is less than the actual “planned” capacity). In order to contest these effects, a buffer will appear almost spontaneously (in cases where the planned production exceeds the demand), or a buffer will be created intentionally (in cases where the capacity may not comply with the actual demand) between both goods flows.

Within this buffer, a regular inflow and an irregular outflow of the end product will occur. For the duration of this model's description, this buffer will be called the decoupling point (abbreviated as: D.P.). As a rule, there will not be any stock in the company after this point. The decoupling point model is an important model for the following reasons:

- a. the D.P. will indicate the point in the supply chain where the management method is modified (from plan-driven to order-driven);
- b. the D.P. usually forms part of the final (and mostly the largest) supply point in the supply chain; the area from which clients / customers are serviced;
- c. the creation of stock in the D.P. allows a certain kind of freedom which lets upstream activities occur independently from the downstream activities;
- d. the D.P. will indicate the area where an order should be submitted;
- e. the D.P. divides the supply chain into two subsystems, where decision-making and management styles usually differ largely. While capacity occupation is dominant upstream, customer / client service is dominant downstream;
- f. the D.P. indicates the point where the client's order or the internal order penetrates the supply chain.

From the abovementioned it is clear that the buffer stock (decoupling point) does not necessarily imply that it consists of end products. The decoupling point can also be implemented in totally different areas although the area depends on the nature of the product, the market and the company.

There are five possible positions for a decoupling point:



1. Manufacturing and dispatching of stock (consignment)



2. Manufacturing of stock (consignment)



3. Assembling (client specific manufacturing) on order



4. Manufacturing on order



5. Procurement on order; manufacturing and supplying afterwards



Fig. 1.4: Possible positions of the decoupling point.

Effects and risks of the decoupling point positions

To discuss all DP's would not be useful at this point as we only have a model and models tend to over simplify reality. The chain, as portrayed in the example above, is only one chain, not the chain. The model can be adopted to fit your own chain, after it has been converted into a model. The optimal location of the D.P. will immediately become clear and as the D.P. shifts upstream or downstream, certain effects of the extreme positions 1 and 5 will become less evident. At this point only two decoupling point positions will be discussed.

We have also noticed how an intermediary decoupling point position will have acquired more of the effects of an extreme decoupling point's position, the closer the intermediary D.P. is situated to the extreme D.P. Decoupling point positions 1 and 5 are described as follows.

The main advantage of decoupling point position 1 is the opportunity to offer shorter delivery periods, as the delivery period does not depend on production capacity, but on stock quantity only. All products bought on a daily basis by the consumer, belong to the DP 1-type. When the turnover of these types of products cannot easily be predicted, situations may occur where product stocks will either be inadequate or superfluous.

Stock shortages will create a very poor impression to clients and it will severely impede the initial advantage of shorter delivery periods. As a result, orders may decrease. The only way to prevent a reduction in orders and to create the ability to supply every time is to deliberately keep more end product volumes in stock.

The next disadvantage is the relatively high value that is attributed to the stored goods, due to the fact that all offers in respect of the manufacturing of the end products have already been submitted. In other words, the company in question has already added all the value to the products, which causes the capital attached to inventory and fixed assets to be quite high.

Another important disadvantage is the fact that some end products may be perishable. Mainly because the end product stocks are larger (for reasons mentioned earlier) and will require a longer waiting period, the risk of perishable goods may therefore be an even greater threat to the capital invested in the expiring stock.

As the decoupling point shifts further upstream, in the direction of D.P. 5, the abovementioned disadvantages will decrease. However, as the order penetrates the supply chain even deeper, delivery lead times may become longer and supply reliability may become less.

The delivery lead time depends to a large extent on the processing time of the order in the supply chain. The implication is that the upstream location of the decoupling point will depend on the processing time; this should at least

be equal to the desired delivery lead time, or in the face of a fixed security margin, even shorter. The flexibility of the downstream processes should, additionally, be of such a nature that fluctuations in demand could be addressed efficiently.

A sudden increase in end product demand can only be met successfully when it is supported by an adequate production-, storage and internal transport capacity. Should the decoupling point be located at position 5, then both the supplier's delivery period and its supply reliability will greatly influence the performance of the logistical system.

Test Questions

Please decide if the following are true or false:

- An order-driven goods flow occurs when the ordered goods are “pulled” through the chain by the individual order. (true)
- An important disadvantage of the order-driven goods flow is that it does not enable the company to react directly to a customer's order. (false)
- The important characteristic of a plan-driven goods flow is that the activities are based on a forecast and a plan. (true)
- With distribution logistics the goods flow is mainly plan-driven. (false)
- The decoupling point D.P. is the point in the supply chain where the management method is modified (from plan-driven to order-driven). (true)

9.9 Customer service

Learning objective:

The student should understand the main customer service issues in logistics and how they are managed applying service level agreements and key performance indicators.

An exceptionally important aspect of logistics is “Customer Service”. There are various definitions of “Customer Service” around these days. Customer Service is best experienced through the service that is offered to the client, e.g. supplying of the right products, at the right place, at the right time, in the right amount and of the right quality. Although very simple, this principle will mean nothing unless it is supported by a shared attitude throughout the company (including financial administration and sales), to improve the service to the customers/clients. The Customer Service of a company also includes technical assistance, guarantees, payment conditions, supplying spare parts, availability, etc. All of these issues can be incorporated in the term “Supply Reliability” in which the forwarder has an especially significant part to play.

It is important for companies who want to make a profit that the margin between cost – and retail price be as high as possible, in order for the company to continue its business. This margin is established when products or services are retailed at the highest price possible and acquired at the lowest price possible. The retail prices are determined by the Sales Department and the low cost prices amongst others by Logistics.

Customer Service is one of the most important links between Sales and Logistics. Eventually the performance of logistics will be reflected in Customer Service and costs. Sales depends on the manner in which Customer Service is delivered, and the price to be paid for this Customer Service will be based on performance.

When the phenomenon of Customer Service is limited to only one definition, it may lead to a great deal of confusion. Bernard J. LaLonde en Paul H. Zinszer have categorised all statements of companies and concluded that Customer Service can be divided into three levels, namely:

a. Customer Service as an activity

Where Customer Service is considered an activity, it is presumed that Customer Service should lead to the fulfilment of client demand. The manner in which the order is treated, shipment, compensation for damages, etc. are all typical aspects. In this instance, Customer Service is seen as a separate activity instead of an integral part of Logistics.

b. Customer Service as a measure of performance

Customer Service as a measure of performance is expressed in the percentage orders that were supplied on time, intact and of the right quality. These are performance indicators. This expression may be an indication of Logistics performance, but it doesn't give a full representation of Customer Service's real image, which could have lead to the fulfilment of client demands. The so-called "service degree" may cause additional confusion. The service level may well be part of Customer Service, but one should bear in mind that there are many more factors involved in Customer Service.

c. Customer service - a management philosophy

Trying to express Customer Service as a management philosophy, means that Customer Service will be raised to the level of a philosophy that involves the entire company. This perception agrees with the modern opinion on company policy, which states that the focus should be on fulfilling market demand in all aspects and in the most efficient manner possible. This means that Customer Service will no longer be limited by "the performance of the logistical system", but that it will affect all other activities in the company. In other

words: all activities and decisions inside and outside the company will be directed towards client satisfaction.

Supply reliability

It is of great importance to every company that agreements with clients should be honoured. If a company has agreed with a client that certain products will be supplied in a certain amount, at a certain location and at a certain time, then that company should be prepared to comply with those agreements. Every deviation thereof will enforce the impression of poor supplier reliability. Supplier reliability is a direct reflection of the supplier's ability to meet all agreements concerning product, amount, location and time. When a supplier employs a courier company to carry the products to the client, the supplier will have to depend largely on the Customer Service of the courier company to provide the same measure of supplier reliability to its clients.

Lead times

A general maxim that often crops up in Logistics is that, when a client requests a short lead time, this is usually an indication that the client has trouble managing his own logistic system. For example, the client may experience problems with the forecasting of product demand, there may be agreement differences between departments, or there may be an unforeseen shortage in materials, auxiliary materials, products or services. There are many reasons why a logistic system doesn't function as it should. From experience we know that a short lead time can be a very important aspect for competition.

Consumers struggle to predict product demand, most of the time. They only look in the kitchen cupboard once a week, before they set off to deliver messages. They even forget parts of the message as well, because of their frequent rushing from one place to another in the middle of the week in order to satisfy the needs of their men for a specific type of meat or a specific type of dessert. Short delivery lead times are therefore very appropriate for these types of articles. Consumer emotion should also be considered. There are products, e.g. furniture, vehicles and clothing, that the consumer would want to have immediately. Not because they cannot sit or drive or because they're walking around naked, but mainly because they attach certain emotions to a product. Short delivery lead times become a very powerful weapon for the competition in this kind of situation as well.

It seems as if clients (companies as well as consumers) actually demand short delivery lead times. Once again the forwarder, who sees to the transport of these products, has an important part to play in the achievement of these short delivery lead times. One should keep in mind that the delivery

lead time forms an essential part of the forwarder's ability to deliver a professional service as well.

Service level agreements and performance indicators

In order to manage the service level of a logistics services provider in an outsourcing situation, service level agreements are established. These are contracts between the shipper (principal) and his logistics services provider. A service level agreement will describe e.g.:

- A definition of the services (activities) to be provided and a description of the related processes, information etc.
- The agreed service level for each activity (and allowed deviation range from the standard)
- Actions to measure and report the performed service levels
- Actions to maintain the service level, corrections, penalties etc.

To manage the agreed and the real service levels, a continuous cycle is executed of planning, performance, measurement, analysis, adjustment (if needed).

The actual performance is measured, results are compared with predetermined performance standards, and if needed actions are taken to adjust the related processes in order to achieve the agreed standard results (service levels). This requires quantifiable standard performances, which are called performance indicators.

Examples of performance indicators in logistics:

- 97% of all orders delivered complete at the right address within 24 hours.
- 90% of incoming shipments stored on the day of receipt.
- 95% of all complaints settled within 3 days.

The administrative system should be set-up in such a way that all required data can be sampled, analysed and reported with a minimum of manual involvement.

Test Question

Please decide if the following are true or false:

- The Customer Service of a company includes delivery, technical assistance, guarantees, payment conditions, supply of spare parts and the like. (true)

- Performance indicators of customer service can be expressed in the total value of goods in storage (warehouse), number of product quality complaints and sales volume. (false)
- Service level agreements are established to manage the service level of a logistics services provider in an outsourcing situation. (true)
- Percentage of orders delivered within determined delivery time is a suitable performance indicator for a logistic service provider who is responsible for distribution logistics. (true)

9.10 Information Handling and Control Issues

Learning objectives

The student should understand the importance of ICT and EDI in logistics and be aware of the main applications.

The student should be aware of the main techniques for inventory management.

9.10.1 ICT and EDI

Learning objective

The student should understand the background of ICT and EDI and its importance for logistics.

ICT (Information and Communication Technology)

Apart from the ERP-systems, there have been other, revolutionary, developments in the ICT (Information and Communication Technology) industry that have offered more possibilities to logistics than ever before. EDI (Electronic Data Interchange) appeared during the 90's of the previous century. We will cover this in the next paragraph. EDI has the ability to survive for a long time, but will eventually be overwhelmed by a range of new possibilities. It will not serve the purpose of this module to explain the advantages of each technology as all were created through the clever combinations of advanced technology applications; a process that is currently continually being improved upon. A few of the building blocks are:

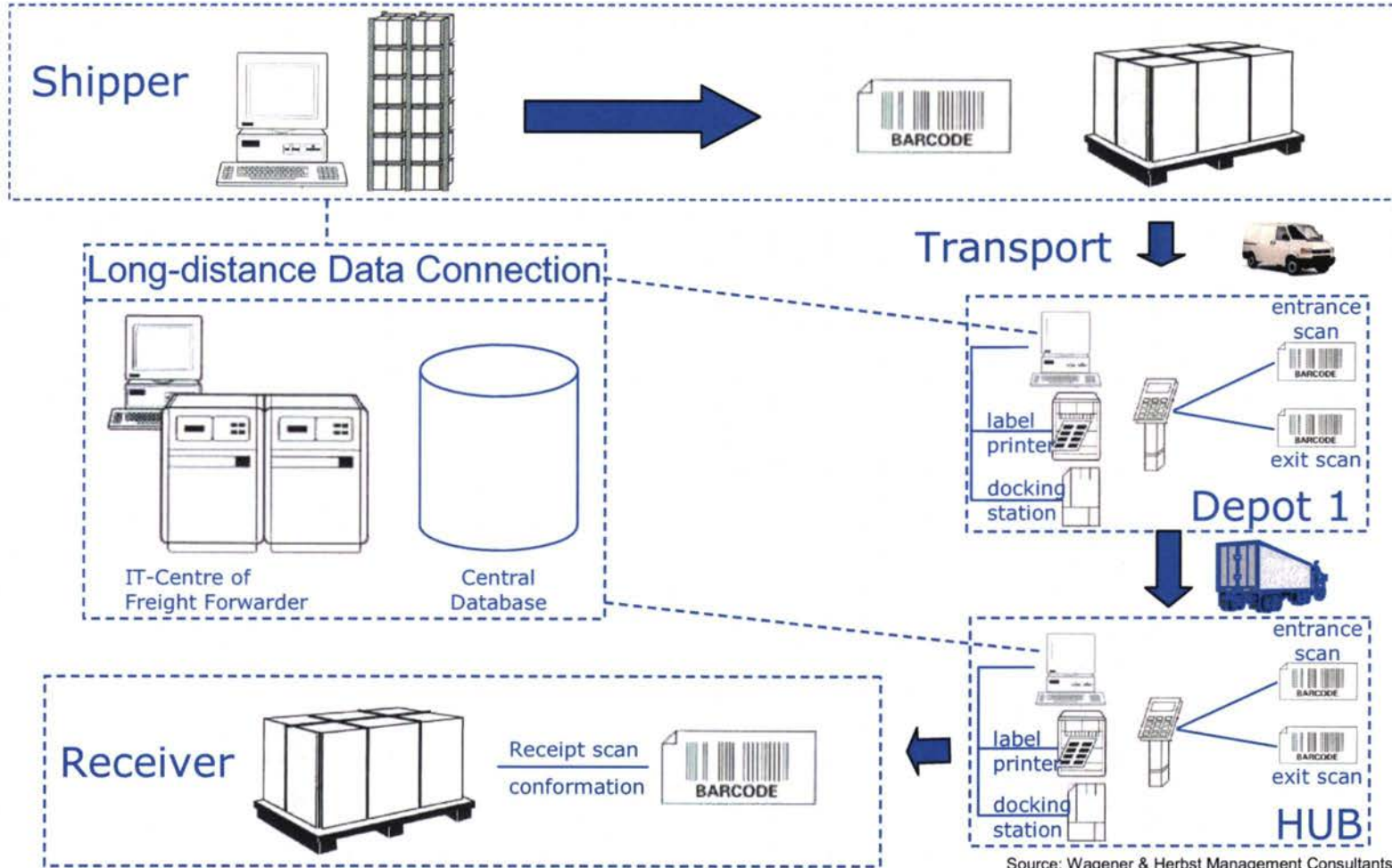
Internet	- a worldwide information infrastructure
GPS / Galileo	- American and planned European satellite positioning system with location determining capabilities
Improved data transmission (wireless/glass fibre cable)	- any type of data (from reefers to entire B/L's can be received verbally, anywhere

- | | |
|------------------|---|
| RFID-chips | - readable and writable chips containing fixed and varying information; the size of a pin-head; costing 5 cents a piece in 2004 |
| Optical scanners | - to read barcode information on movable objects |

Supply chains have always been very vulnerable to damage and robbery. Estimations have indicated that, (measured in terms of sales value) approximately 2% of all produced goods have not been settled eventually. One of the main reasons why large investments are being made in management systems that have new technologies to their disposal, is the expectation that the percentage of what is called “shrinkage” by the Americans, will plummet as a result.

For a supply chain management with Barcoding see the following Diagram.

Information Technology (IT) with Barcode



Source: Wagener & Herbst Management Consultants

EDI (Electronic Data Interchange)

EDI entails the electronic exchange of structured information. Details regarding the nature, quantity, etc. of the goods won't have to be communicated via telephone or fax in this case, but solely via computer. Through EDI, the computers of the sender and the receiver of information have been connected with each other. A data line can now assist the sender in sending standard reports to the receiver's computer. The receiver will be able to process the dispatched information immediately, which means that it will no longer be necessary to capture the information.

Commercial data lines have never been used in an EDI set-up. The arrival of the Internet has seen the return of the electronic infrastructure. EDI itself, however, has not! Too many applications have been created. A distinct example is the electronic declarations that are made at Custom and Revenue Services. These are 100% web-based.

Standardisation is performed by the UTC (Uniform Transport Code) Foundation.

At the moment attempts are being made to integrate EDI with the ERP-systems and to convert existing EDI's into web-based applications, of which there are currently not many around.

An extraordinary form of EDI is Electronic Fund Transfer (EFT). Seeing that product ordering is performed electronically, it only makes sense that payment for these orders is done in the same manner. Issues regarding security cause people to be more reserved about EFT, than with other EDI-applications.

Tracking and Tracing

Tracking and tracing allows a vehicle, load, shipment or article from storage can be followed over a period of time (tracking) and / or recovered (tracing). Information about the status of the shipment and its completion can be relayed to the client in this manner. Tracking and tracing activities are performed using barcodes or "radio frequency tags" for identification and registration purposes, and provides input in respect to stock, delivery and receiving control, as well as checking the location and status. One or the other is communicated, for example, via satellite communication, location systems (GPS), mobile phone or car phone.

The receiver can be notified of delays. which is an example of additional service to the client.

Test Question

Internet	- a worldwide information infrastructure
GPS / Galileo	American and planned European satellite positioning system with location determining capabilities
Wireless/glass fibre	- any type of data (from reefers to entire B/L's can be
Transmission	- received verbally, anywhere
RFID-chips	- readable and writable chips containing fixed and varying information; the size of a pin-head; costing 5 cents a piece in 2004
Optical scanners	- to read barcode information on movable objects
Tracing	- vehicles or consignments can be followed over a period of time from the home base
Tracking	- vehicles or consignments can be recovered in their position or status

9.11 POS (Point Of Sale) Information

Learning Objective

The student should know what is a POS information.

The most accurate information in respect to customer demand can be obtained from the point of sale: the pay-desk. At present there are so many applications of which the pay-desk should not only be aware of, but also be able to perform an upstream transfer of information regarding a sale in the chain. The production plan and additional stock control can subsequently be managed. This form of stock replenishment is also known as Electronic Replenishment or Automatic Replenishment.

It may look simple, but standardisation requires a lot from the players involved in the chain. Everyone should be prepared to make their ERP-system and other stock control systems accessible for this type of data. In reality, only the largest companies have adequate economies of scale to compensate for investment costs.

Test Question

- POS information is generated in the warehouse. (false)
- POS information is generated at the cashiers desk. (true)
- POS information is used for Electronic Replenishment or Automatic Replenishment. (true)

9.12 Inventory management techniques

Learning objective

The student should be aware of the main techniques for inventory management.

General

Before the implementation of the computer, management was accomplished only through labour intensive administrative procedures. Attempts were made to apply methods that could provide the best security, with the least amount of labour, at the lowest costs. The stock-driven goods flow is an example of such a method.

Even now there are still organisations that don't have the adequate computer facilities to accommodate the application of complex management methods. Consequently, these organisations will have little choice in the management technique that will be applied.

The complexity of the goods flow will determine the management technique to a large extent. As the complexity increases (nature of the goods, production, diversity, the distribution channel, organisation, etc.) more advanced management techniques will become involved.

Stock-driven methods

A common method when managing a goods flow is the stock-driven goods flow. Its popularity may be due to both its simple techniques and the simplicity of the signal that is used to activate the goods flow.

The stock-driven goods flow is initiated from a supply point. After stock control was performed, and it was established that a particular product, semi-manufactured article, equipment or auxiliary material was required, it would be enough reason to issue an order to production or to place an order with a supplier.

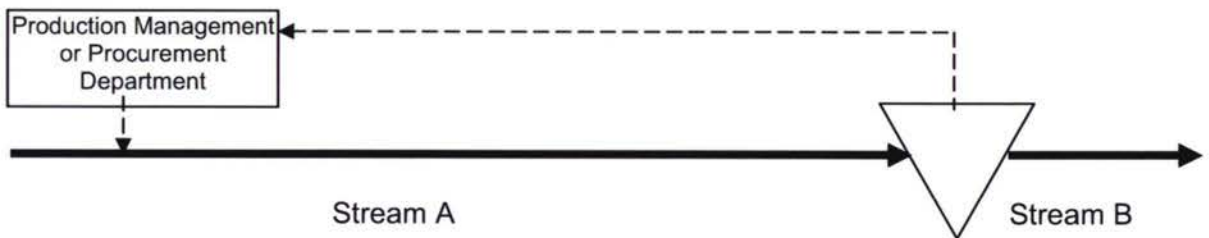


Fig. 1.6: The technique of stock control.

The variety of products in stock and the quantities per item (product, material, packing unit per product) are determined according to the demand of either an internal department, or the client (Stream B). Sufficient stock levels regarding variety and quantity can only be achieved through

constantly trying to form an idea of what eventual and future demands will be.

Once stock control has established that there is too little stock on hand for a specific item, an order will be issued to replenish the item (Stream A). In order to determine what, how many and when to order, there are various ordering systems available, e.g. the BQ-system or the sS-system. We will discuss these in more detail in the Chapter on Stock Control.

We also have to determine how it was possible for the goods flow to be dispatched to the supply point (Stream A) as *order-driven*, seeing that it can only be activated by issuing an order from stock control.

Materials Requirements Planning (MRP I)

The first example of automatic goods flow management was the Materials Requirements Planning, or rather “MRP I”. In spite of what its title might suggest, management does not only budget for the acquisition of materials and the like, but also for production quantities and sequence.

This management technique has been in existence since the beginning of the 20th century. This type of management became practically feasible when the progress in the computer company, during the 1950’s, was such that its commercial use first became possible.

Based on a forecast of demand or on the quantity of orders generated from a supply point, end users or clients, a task planning may be compiled for a certain period. This is called the Master Production Schedule (MPS). The MPS functions as the task definition according to which materials are planned and activities should be performed.

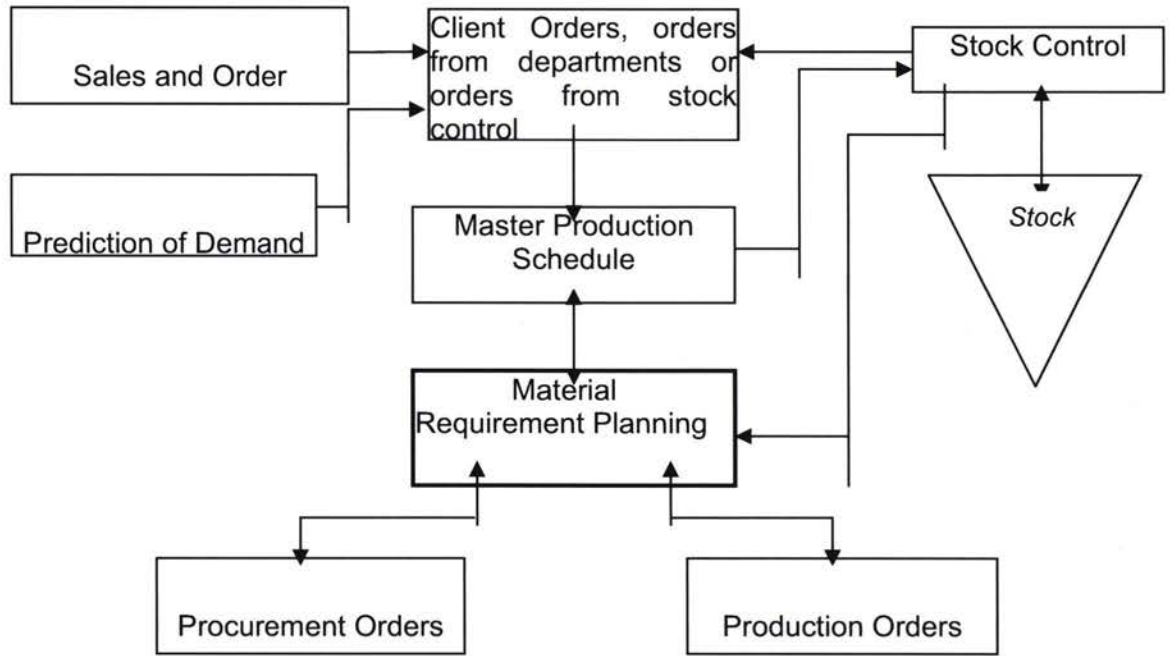


Fig. 1.7: A schematic representation of the Materials Requirements Planning's techniques (MRP I).

The MRP I-type of management is applicable to both a *plan-driven* goods flow, as an *order-driven* goods flow. In the case of a plan-driven goods flow, prediction of demand will result in a job description in the MPS. With an order-driven goods flow, the sales orders will form the basis for a job description in the MPS. In stock control, the replenishment of the stock will be a determining factor for the planned tasks (see the schematic representation in Figure 1.7).

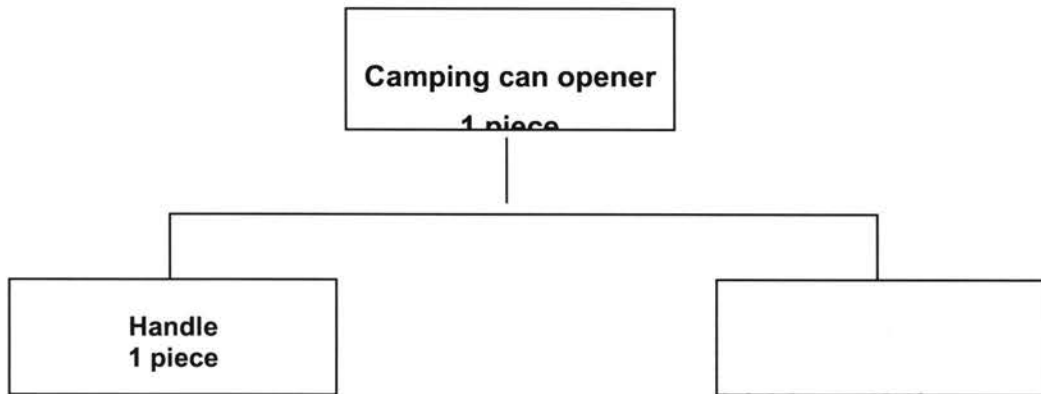
In determining the MPS as well as the MRP- I, both the available stock on hand for procured or produced items should be considered. A simple example of an MRP I would look like this:

Example MRP1

Master Production Schedule

Product	Week							
	12	13	14	15	16	17	18	19
Garlic press	210	130	100	0	0	230	160	150
Camping can opener	500	620	750	700	870	610	530	550
Tea strainer	120	150	310	270	200	240	260	240
Nutcracker	90	70	90	110	120	80	60	70

Product explosion Camping can opener



Assembly Plan end product: Camping can opener

Replenishment Strategy: production series equal to net requirement

Plan for available stock

during first week: 2.100 pieces

Production or delivery lead time: two weeks

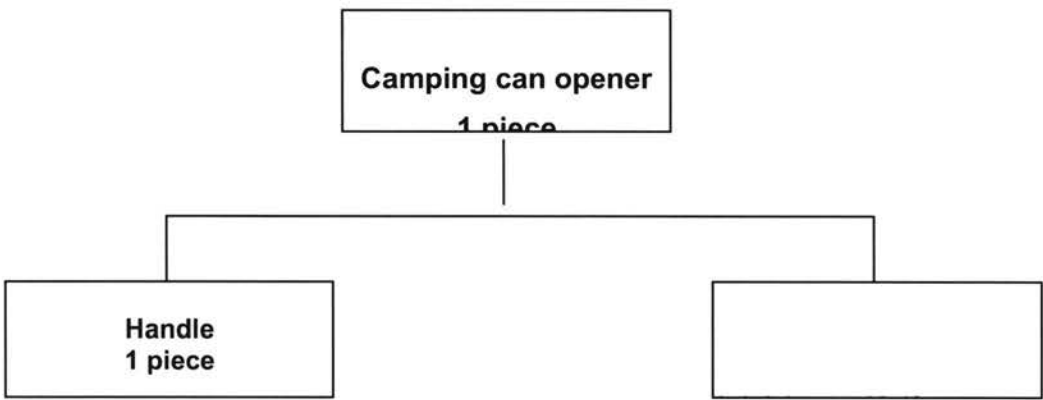
	Week							
	12	13	14	15	16	17	18	19
Gross requirement	500	620	750	700	870	610	530	550
Stock	1600	980	230	0	0	0	0	0
Net requirement	0	0	0	470	870	610	530	550
Planned Receiving				470	870	610	530	550
Planned Order Issuing		470	870	610	530	550		

Example MRP1

Master Production Schedule

Can opener								

Product explosion Camping can opener



Assembly Plan end product: Camping can opener

Replenishment Strategy: *production series equal to net requirement*

Plan for available stock

during first week: *2.100 pieces*

Production or delivery lead time: *two weeks*

Component								
Component								
Component								
Component								
Component Issuing								

Procurement Plan: Knife

Replenishment Strategy: series of orders equal to net requirement

Plan for available stock

during first week: 800 pieces

Delivery period: 1 week

	Week								
	12	13	14	15	16	17	18	19	
Gross requirement		470	870	610	530	550			← A
Stock	800	330	0	0	0	0			
Net requirement			540	610	530	550			
Planned Receiving			540	610	530	550			
Planned Order Issuing		540	610	530	550				→ B

Procurement Plan: Handle

Replenishment Strategy: series of orders equal to net requirement

Plan for available stock

during first week: 1.500 pieces

Delivery period: three weeks

	Week								
	12	13	14	15	16	17	18	19	
Gross requirement		470	870	610	530	550			← A
Stock	1500	1030	160	0	0	0			
Net requirement				450	530	550			
Planned Receiving				450	530	550			
Planned Order Issuing	450	530	550						→ C

Assembly Orders

	Week								
	12	13	14	15	16	17	18	19	
Garlic press									
Camping can opener		470	870	610	530	550			← A
Tea strainer									
Nutcracker									

Procurement Orders

	Week							
	12	13	14	15	16	17	18	19
Screws, round 2 mm								
Straining material								
Handle	450	530	550					
Knife		540	610	530	550			
Rivet Press								
Tea Strainer Plastic Handle								
Nutcracker Lid								

C
←
B
←

Manufacturing Resource Planning (MRP II)

During the 1970's, the calculating capacity of computers increased to such an extent that management systems were almost obliged to expand. Via a few intermediary steps in the 60's and 70's, the so-called Manufacturing Resource Planning System (MRP II) was established around 1978.

Materials Requirements Planning (MRP I) still stood central in the MRP II. Manufacturing Resource Planning however, allows for the long-term *and* strategic level planning of the goods flow. The system also allows the direct dispatching of production's working platform, seeing that production orders have to be converted into daily work orders of a specific priority (see Figure 1.8).

The available production capacity is then also taken into consideration.

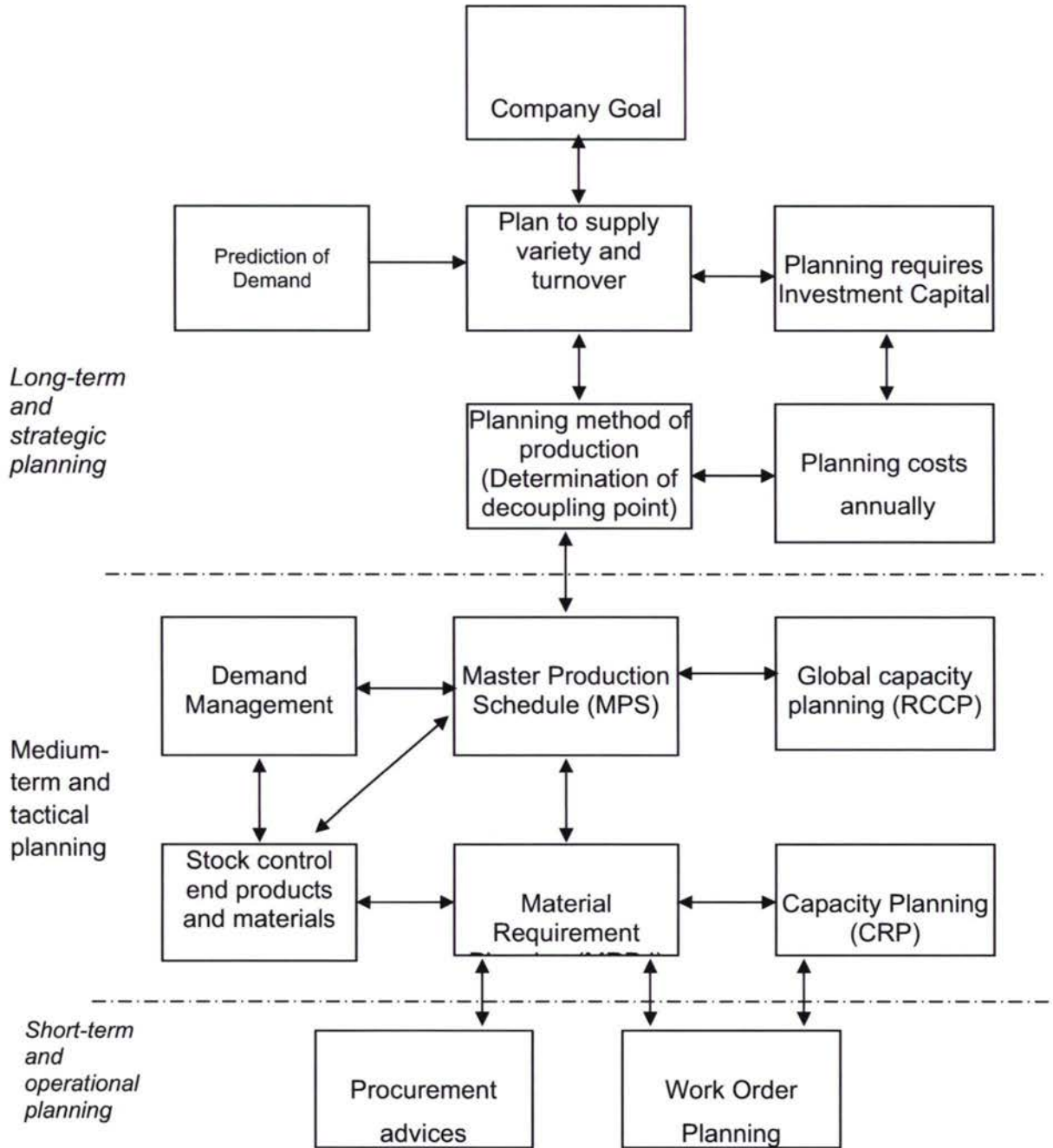


Fig. 1.8: A simplified version of the Manufacturing Resource Planning System.

A serious disparity with regard to MRP I, is the fact that it allows for the so-called “balancing” of plans. The implication is that all plans, as indicated in Figure 1.8 with vectors to both sides, will have to be arranged between each other.

Distribution Requirements Planning (DRP I)

In close relation to the Materials Requirements Planning (MRP I), the Distribution Requirements Planning (DRP I) was established during the 1980's. The intention of this planning system is to consolidate the actual orders of various clients or subsequent trade companies in the distribution channel into one, joint demand for the central supplier and/or manufacturer. This consolidated demand will make up the task definition of the supplier or manufacturer.

The demand that leads to the job description may be an actual demand from the clients or subsequent trade companies, but it may also be based on a prediction made by these clients or trade companies in respect to demand. The first example may be indicative of an order-driven goods flow and the second of a plan-driven goods flow.

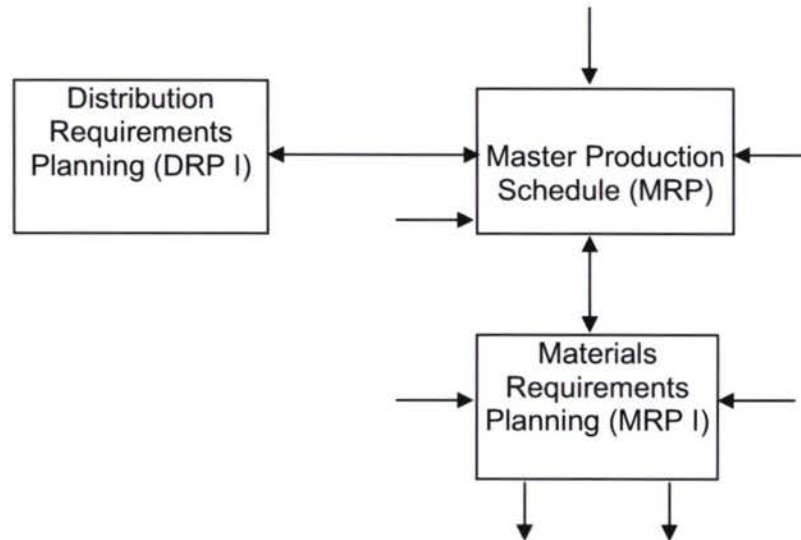
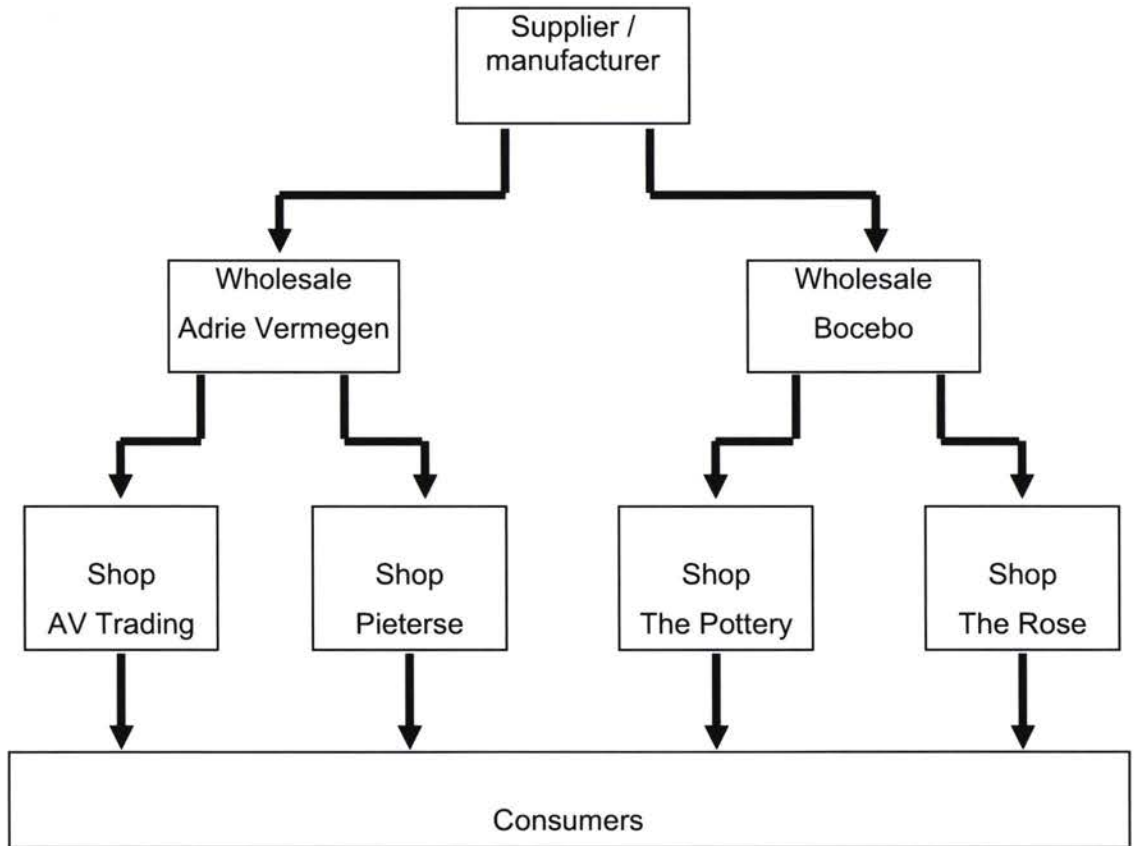


Fig. 1.10: The connection between Distribution Requirements Planning (DRP I) and Materials Requirements Planning (MRP I).

Example of DRP I planning

Format of the distribution channel



Expected demand Shop AV Trading

Article	Week							
	21	22	23	24	25	26	27	28
Pot model Pastunetta	12	9	13	10	11	9	10	10
Pot model Optima	5	6	8	6	5	5	5	5
Vase model Beer Barrel	7	13	12	15	12	10	10	10
Pot model Piestella	4	5	4	5	5	5	5	5
Vase model Down-pipe	2	0	1	3	2	2	2	2
Plate model Normal	21	20	24	23	21	22	20	20
Plate model Head	10	9	12	12	15	10	10	0

Expected demand Shop Pieterse

Article	Week							
	21	22	23	24	25	26	27	28
Pot model Pastunetta	10	11	15	8	14	10	9	8
Pot model Optima	21	19	20	18	16	18	24	14
Vase model Beer Barrel	9	8	6	7	3	6	11	6
Pot model Piestella	13	14	16	18	9	12	18	17
Vase model Down-pipe	0	0	0	0	0	0	0	0
Plate model Normal	2	2	3	2	4	2	0	2
Plate model Head	12	19	16	13	19	12	8	11

Expected demand Wholesale Adrie Vermegen

Article: *Pot model Piestella*
 Replenishment Strategy: *series of orders equal to net requirement*
 Plan for available stock
 during first week: *43 pieces*
 Delivery period: *two weeks*

	Week							
	21	22	23	24	25	26	27	28
Gross requirement	17	19	20	23	14	17	23	22
Stock	26	7	0	0	0	0	0	0
Net requirement	0	0	13	23	14	17	23	22
Planned Receiving			13	23	14	17	23	22
Planned Order Issuing	13	23	14	17	23	22		

Expected demand Wholesale Bocebo

Article: *Pot model Piestella*
 Replenishment Strategy: *series of orders equal to net requirement*
 Plan for available stock
 during first week: *94 pieces*
 Delivery period: *two weeks*

	Week							
	21	22	23	24	25	26	27	28
Gross requirement	25	30	29	34	31	28	24	28
Stock	69	39	10	0	0	0	0	0
Net requirement				24	31	28	24	28
Planned Receiving				24	31	28	24	28
Planned Order Issuing		24	31	28	24	28		

Expected demand Manufacturer

Article: *Pot model Piestella*
 Replenishment Strategy: *series of orders 100 pieces at a time*
 Plan for available stock
 during first week: *24 pieces*
 Delivery period for central supply: *one week*

	Week							
	21	22	23	24	25	26	27	28
Gross requirement	13	47	45	45	47	50		
Stock	11	64	19	74	27	77		
Net requirement		36		26		23		
Planned Receiving		100		100		100		
Planned Order Issuing	100		100		100			

Master Production Schedule Manufacturer

Product	Week							
	21	22	23	24	25	26	27	28
Pot model Pastunetta	200	200	150	100	50	100	50	100
Pot model Optima	300			150	150	300		
Vase model Beer Barrel		112	98			145	143	65
Pot model Piestella	100		100		100			
Vase model Down-pipe				200			200	
Plate model Normal	36	49	68	38	47	54	71	52
Plate model Head	40	40		80		40	40	

Distribution Resource Planning (DRP II)

Distribution Resource Planning (DRP II) can be regarded as an extension of the Distribution Requirements Planning System (DRP I). The DRP I does not take the input of capacity, e.g. transport system and storage capacity, into account. Whilst following closely in the footsteps of Manufacturing Resource Planning (MRP II), capacity planning as well as a level of strategic planning similar to that of the MRP II was added to the DRP II simultaneously. The functions of these strategic, and even a part of the overall plan, became equal to those of MRP II.

As was the case with the Manufacturing Resource Planning System (MRP II), a state of balance has been created between the various plans.

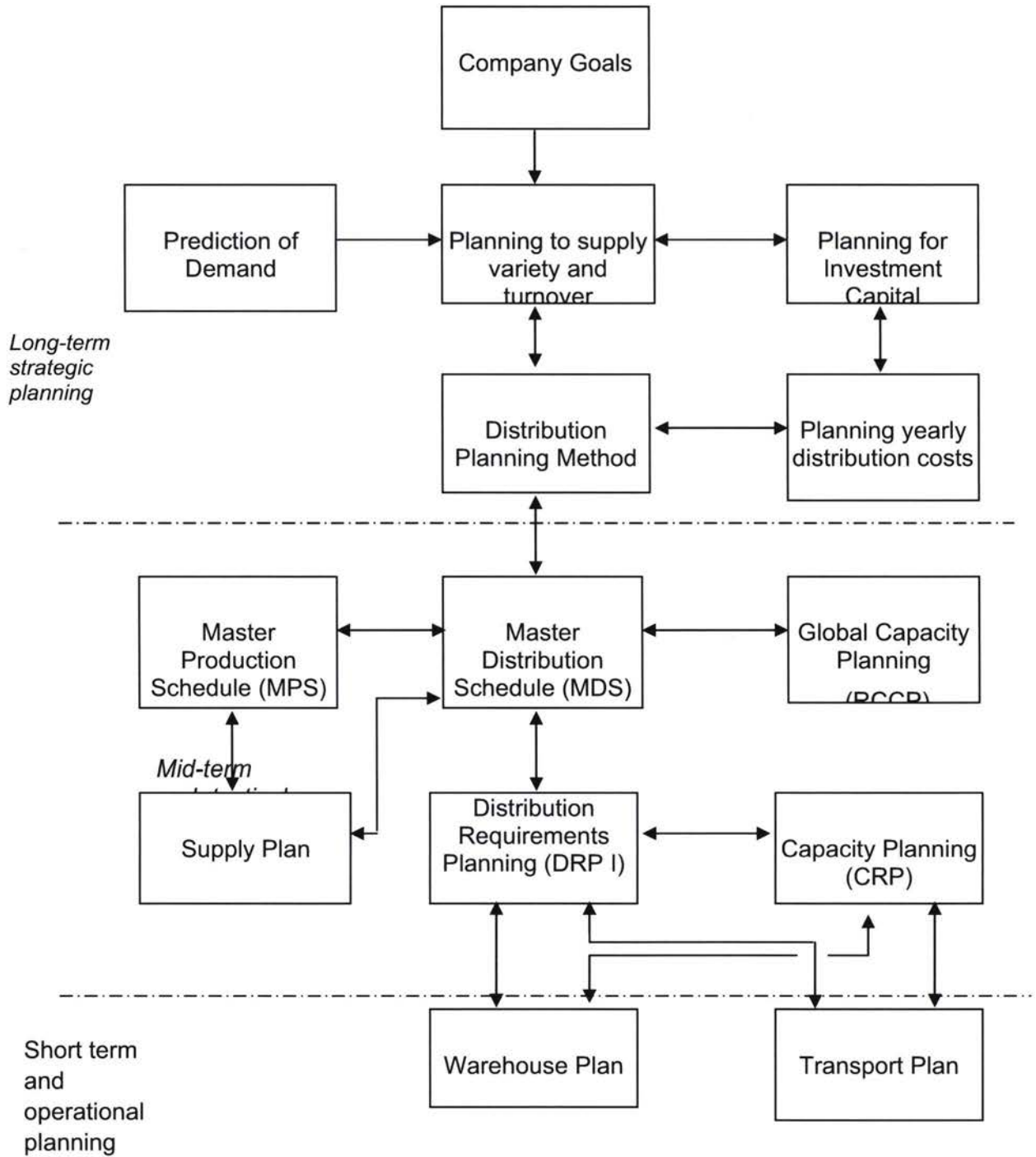


Fig. 1.11: A simple version of the Distribution Resource Planning System (DRP II)

Just In Time (JIT)

The term Just In Time (JIT) is used for many things that have actually nothing to do with Just In Time. JIT as a management technique is much older than its title. It was Henry Ford I who repeatedly attempted to return stock levels to the minimum (especially the work in progress stock), in a number of ways. It was this attitude that empowered him to assemble and supply a motor car only 8 days after having received the order for it.

JIT is a firstly *management philosophy*. *Management techniques* only take second place.

JIT as management philosophy is based on a number of principles, the most important of which are:

- A. All activities, investments costs, functions and administration that don't add to the value of a product, are regarded as waste.
- B. Stock keeping doesn't add to the value of a product, thus stock keeping is also waste.
- C. In order to prevent stock keeping, the effort should be made towards a production and order series of only *one* piece of material, one product, etc. at a time.
- D. In order to acquire a production and order series of one piece at a time, without product price increase, an attempt should be made to achieve machine adjustment and preparation times of *zero* seconds.
- E. By *standardising* production and distribution, as well as the products and materials, the machine adjustment and preparation times will be returned to normal and will not be reflected in the product's cost price.
- F. The operational employees should be involved in the company's entire policy, as far as possible.
- G. Improvements to the production and distribution process are made continuously by the operational employees and they have to develop and introduce these on their own (with the possibility of assistance in the future).
- H. The only measure of *quality* is that which is acknowledged by the client.

The management philosophy of Just In Time devotes its attention to many issues, e.g.:

- Reduced order quantities and production series;
- Minimising stock in the system;
- Initiating and maintaining a training schedule for operational employees;
- Developing team spirit between operation employees;
- Simplifying management to a level where mistakes will become almost non-existent.

The goal of the Just In Time-management, like Ford, is to prevent the manufacturing or the utilisation of material, semi- manufactured articles and end products coming to a standstill (which would imply storage).

A simple, but not less ingenious management method, has been discovered to this end, namely *KANBAN*-management. Kanban is a Japanese word that literally means “card”.

This card can be used to guide the supply, production and distribution processes. This system didn't require any computers.

Enterprise Resource Planning (ERP)

A more or less justified complaint about the Manufacturing Resource Planning System was that it stood apart from commercial strategy and tactics planning and from sales activities. It was also incapable of communicating effectively with financial planning on a strategic, tactical and operational level. During the 1990's however, computers became so advanced that all planning concerning commercial, logistical and financial activities could be accommodated in one system.

The automation systems that join these strategic functions are called “Enterprise Resource Planning Systems” (ERP). All that ERP-systems actually do is to join the original “standalone”-systems of financial planning and administration, commercial planning and administration and logistical planning and administration (see Figure 1.9).

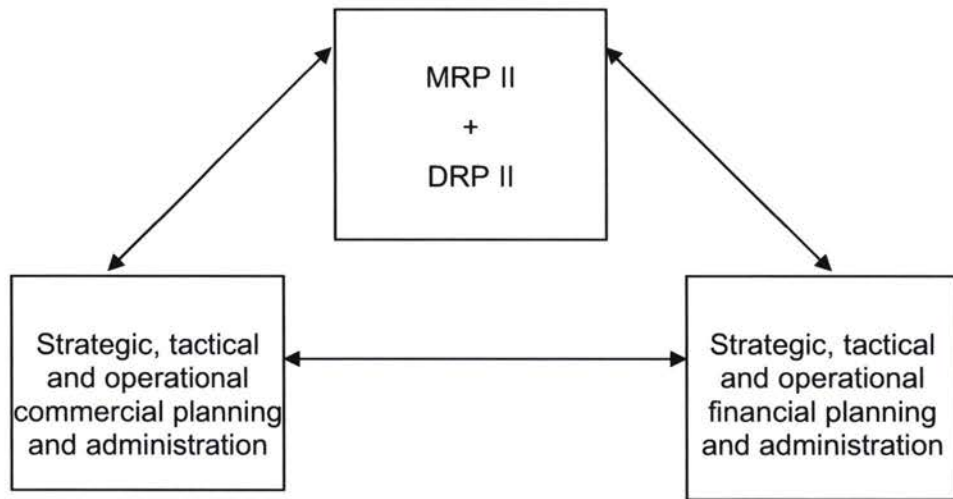


Fig. 1.9: Simplified version of van Enterprise Resource Planning (ERP).

ERP-systems haven't reached their developmental threshold yet. These systems are actually presented in parts by their suppliers. After approximately 75% of all large companies in Europe, the USA and the Far East have employed an ERP-system for their main activities during the past 10 years, suppliers have also expressed their intent to acquire more basic versions for medium to small companies.

Test Questions

Indicate which description belongs to which terminology.

Stock driven method	Orders to produce and / or to replenish goods are issued through stock control.
Materials Required Planning (MRP 1)	Production planning is generated from forecast or from quantity of orders. (Master Production Schedule MSP)
Manufacturing Resource Planning (MRP II)	The system allows the long term planning of the goods flow and the direct dispatching of production orders taking into consideration the available production capacity.
Enterprise Resource Planning (ERP)	The system combines all planning concerning commercial, logistical and financial activities in one system.
Just In Time	All activities, investments costs, functions and administration that don't add to the value of a product, are regarded as waste. E.g. stock is regarded as waste.

9.13 Value Added Logistics

Learning objectives

The student should understand the main examples of value added logistics and the reasons why these activities are postponed by shippers to logistics services providers.

Value Added Logistics (VAL) is a relatively new concept for logisticians. Many companies – especially in America – have already been introduced to the basic principle behind the concept some time ago.

VAL can be defined as performing manufacturing operations in the distribution stage based on customer orders, aimed at making products client- or country specific.

The final processing phase in the entire production process is shifted from a production unit to a later stage, i.e. an international distribution centre.

At the same time, the decoupling point of orders in the supply chain is often pushed upstream.

A VAL-unit can transform a product's form, function and location in an effort to supply it according to production, logistical and service-technical specifications.

VAL is basically possible in all production processes that entail compounded products with limited finishing operations. The mass production of soap powder or butter by Unilever will, however, not be considered.

The most important reasons for the existence of VAL are locked up in the demands that are increasing in the field of service providing, as well as the maintenance of excellent relations with the competition, which are all aiming for more rapid supply of client-specific products in the end. To put it another way, VAL is offering opportunities to improve effectiveness/productivity, which can be beneficial to all parties. Low amounts of stock on hand, low distribution costs or economies of scale in production and service providing are a few examples of what can be achieved when productivity/effectiveness is improved.

Three basic forms of VAL can be roughly distinguished:

Value Added Shipment:

Re- packing and packaging, labelling, re-conditioning, assembling displays or kits with several products, controlling etc.;

Value Added Servicing:

Technical quality control, sampling, testing, activities related to customer service;

Value Added Transformation:

End- assembly and configuration from separate units, repair of returned goods; examples:

- final assembly of components to motor cycles in order to reduce transport volumes,
- insertion of manuals and electrical cords only after order receipt, in order to make the goods customer- / country- specific at the latest moment, in order to reduce inventories.

Value Added Shipment is the basic service that companies in the actual distribution branch are offering to which other, more advanced services are added.

Value Added Transformation, relatively seen, contributes the most to the added value, seeing that the form and function of different products are altered in the process.

Apart from the more obvious VAL-services such as warehousing (packaging, module building, total distribution, etc.) - that are actually more suited to the area of transport companies and logistic service providers - training, empowering chain management, financing, technical support advice and telecom-services are examples of activities that may enhance a product or a service.

Important factors for successful VAL implementation are:

- In the development of VAL, both the shipper and the service provider should think pro-actively and should focus on improving the entire supply chain. Sub-optimisation should be prevented;
- The advantages of VAL need to be proved to the shipper. These advantages will mainly comprise lower stock volumes in the chain, coping with fluctuations, shortened lead times, enhanced customer service, acceleration of information exchange and financial settlement, etc.
- For many tenderers VAL implies an investment in areas such as marketing, production processes, logistical processes and also information technology, contracts, cooperation agreements, etc.
- Trust should develop from both sides. From a birds eye view, processes can be implemented step by step; for various specialists, cooperation agreements can be composed to encourage joint investments and to eliminate the lack of knowledge of many tenderers.

Time is required to organise service providing. It will yield a win-win situation to both shipper and logistical service provider on the medium to long term. The importance of the time issue should be clearly tangible between parties during negotiations and they should be prepared to commit themselves and to risk investment.

Test Questions

Please decide if the following are true or false:

Value Added Logistic services can be for example:

- R re- packing and packaging
- W financial accounting
- R repair of returned goods
- R technical quality control
- R sample testing
- W transport
- W customer satisfaction surveys
- R final assembly

9.14 Commodity Related Systems

Learning objectives

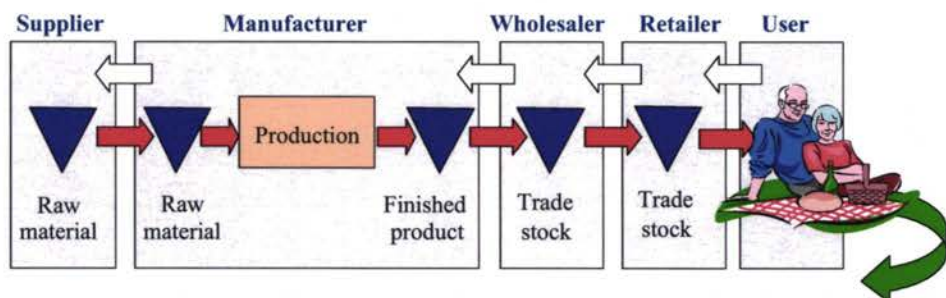
The student should understand a number of supply chain management issues which are specific for certain commodities, such as in the automotive- and food industry.

9.14.1 Automotive industry

Learning Objective

The student should know a number of specifics in automotive logistics.

The illustration below shows a general supply chain with the relevant parties, information flows (white arrows), goods flows (red arrows) and inventories (blue triangles).



The automotive industry differs from the general principles in certain aspects:

- many production processes are executed parallel (bodies, components, engines, transmissions etc.) and come together in the final assembly;
- the traditional order process via retail, wholesale to manufacturer, is often by-passed.

The approach for the Smart car is described below:

Smart cars are built to customer order. The process is as follows:

- o The customer answers 15 questions;
- o Software develops a product proposal;
- o The customer can alter the product with a limited array of options;
- o The customer orders the vehicle on-line or at a Smart centre;
- o Production is based on POS data (Point of Sale)
- o Re. www.smart.com

Test Questions

Please decide if the following are true or false:

- R More and more cars are built to order
- W Special hygienic rules must be followed during the production of cars.
- R Many production processes are executed in parallel.
- W Car production must be temperature controlled.

9.15 Food Industry

Learning Objective

The student should know certain specifics of the food industry.

A major item in the supply chain of food products is the traceability of the products. This is requested by authorities in order to safeguard public health. In case of irregularities it must always be possible to remove the products which cause possible danger to human health, due to contamination or other dangers, directly from the supply chain.

In this respect 2 EU guidelines are mentioned.

HACCP (Hazard Analysis & Critical Control Point System)

All companies in the food industry or food distribution sector are bound by these guidelines. HACCP is a risk analysis & control procedures system on food safety. The system was developed by the US NASA to prevent any hazardous situations for astronauts resulting from foodstuffs.

It comprises the following 7 steps:

- (1) Identification of critical control points;
- (2) Establishment of limit values;
- (3) Establishment of preventive measures;
- (4) Establishment of monitoring procedures;
- (5) Establishment of corrective actions;
- (6) Establish verification procedures;
- (7) Keeping records.

A critical control point is a point in the production or handling process where hazards for human life from microbiological, chemical or physical contamination can be controlled (=prevented) by adequate countermeasures, e.g. by cooking in the process.

General Food Law

The General Food Law is also part of the EU legislation from 2005. The General Food Law can be regarded as an addition to HACCP.

One of the main issues is the tracking & tracing of food products, in all phases of production and distribution which had not yet been required in HACCP.

The objective is: a faster reaction to food safety incidents. All products should be provided with information of their origin, lot numbers, serial numbers etc.

This information should enable rapid, selective removal of the products from the retail points, as well as tackling of the problem at the source, if needed up to the supplier of the raw materials.

In this situation, automatic identification systems such as bar-coding or radio frequency identification using computer chips, could improve traceability significantly, reducing required labour at the same time.

ISO 22000:2005 for food safety management systems

ISO 22000:2005 specifies requirements for a food safety management system where an organization in the food chain needs to demonstrate its ability to control food safety hazards in order to ensure that food is safe at the time of human consumption.

It is applicable to all organizations, regardless of size, which are involved in any aspect of the food chain and want to implement systems that consistently

provide safe products. The means of meeting any requirements of ISO 22000:2005 can be accomplished through the use of internal and/or external resources.

ISO 22000:2005 specifies requirements to enable an organization:

- to plan, implement, operate, maintain and update a food safety management system aimed at providing products that, according to their intended use, are safe for the consumer,
- to demonstrate compliance with applicable statutory and regulatory food safety requirements,
- to evaluate and assess customer requirements and demonstrate conformity with those mutually agreed customer requirements that relate to food safety, in order to enhance customer satisfaction,
- to effectively communicate food safety issues to their suppliers, clients and relevant interested parties in the food chain,
- to ensure that the organization conforms to its stated food safety policy,
- to demonstrate such conformity to relevant interested parties, and
- to seek certification or registration of its food safety management system by an external organization, or make a self-assessment or self-declaration of conformity to ISO 22000:2005.

(source: www.iso.org)

The ISO 22000 integrates all HACCP requirements and is in conformity with the ISO 9000 series on quality management systems, so that companies can combine ISO 9001 and ISO 22000 into an integrated quality management system.

Test Questions:

Please decide if the following are true or false:

- R HACCP is a system to prevent safety hazards for human health and life.
- W HACCP is only applied in the USA.
- W The ISO 22000 is a special container type for transporting foodstuff.
- R Forwarders and warehouse operators must ensure tracking and tracing of foodstuff according to EU law.

9.16 Rights and Duties of the Warehouse Operator and the Customer

Learning objectives

The student should understand the liabilities of the warehouse owners and the owner of the goods.

The student should understand the terms of contracts related to warehousing.

9.16.1 Liabilities

Learning objectives

The student should understand the liabilities of the warehouse owners and the owner of the goods.

Apart from the general liabilities as an entrepreneur, the warehouse owner is liable for the loss or damage to the goods caused by his failure to exercise care and diligence regarding the goods. The owner of the goods has the burden of proving it.

On the FIATA Warehouse Receipt (FWR) the following is mentioned relating to liability:

“Warehousing is subject to standard business conditions (re. reverse side of the FWR).

As warehouse keepers we are liable to deliver the stored merchandise against presentation of the FWR only, and in case of cession of rights exclusively to the holder of this document being legitimated by an uninterrupted chain of transfers as outlined overleaf.

We acknowledge that we can only lodge a complaint with the legitimated holder of this document if and when this refers to the validity of issue of said document and / or results there from. Our legal lien or right of retention will not be affected by this clause. In case of partial deliveries warehouse receipt must be submitted for entering outgoing stock.”

The owner of the goods is liable for financial damage to the warehouse owner, due to e.g.

- delay on the arrival of the goods
- the omission or incorrect completion of the required documents (such as FWR, customs / dangerous goods declarations etc.) and other relevant information
- damage by his staff whilst visiting the properties of the warehouse owner

These liabilities may contractually be limited, but the details must be clearly defined.

This means that the contract between the warehouse owner and the owner of the goods should be clear on the obligations of both sides, also in terms of procedures etc.

Test Questions:

Please decide if the following are true or false:

- R The warehouse owner is liable for the loss or damage to the goods caused by his failure.
- W The burden of proof is with the warehouse operator.
- R The FIATA Warehouse Receipt contains standard business conditions on its reverse side.
- R The owner of the goods is liable for financial damages to the warehouse operator because of delayed delivery of the goods.

9.17 Terms of contract

Learning objectives

The student should understand the terms of contract related to warehousing.

The warehousing contract should comprise at least the following terms:

Activities: which activities should be performed by the warehouse owner/operator, such as

- (Un)loading
- Checking
- (Un)packing, palletising
- Storage
- Order processing
- Order picking
- Stock control
- Specified VAL activities

This also includes the description of procedures to be followed for handling and administration and required corrective actions in case of irregularities, damages etc.

Goods descriptions:

- Forecasted minimum / maximum / average volumes (inbound / storage / outbound)
- Numbers of commodities to be stored
- Dimensions, weights of products / product groups
- Other technical aspects of the goods relevant to storage conditions and handling (e.g. high value goods, dangerous goods, perishable or vulnerable goods, stackability)

Information: which information should be provided by the warehouse owner/operator or the owner of the goods concerning warehousing activities, on e.g.

- Receipt documents (preferably standardised, such as the FIATA - FWR)
- Picking orders
- Packing lists, waybills
- Labelling of cases / pallets,
- Transport / Customs documents

Performance indicators and quality standards, such as

- *Inbound performance indicator* : e.g. 90% of incoming shipments properly stored and registered (which means ready for order picking) within 8 hours after arrival of the goods
- *Storage performance indicator:* 98% correspondence between administrative- and physical stock levels (expressed in number of pallets or cases, or in value of the goods), to be demonstrated by checking at least 10% of all stored commodities once a month
- *Outbound performance indicator:* e.g. 97% of outgoing orders complete and ready for loading within 12 hours after order receipt at the warehouse administration
- Agreed storage areas and equipment specifications
- Packaging requirements

Prices: All-in prices, but preferably specified tariffs (based on Activity Based Costing) for e.g.

- Storage, per pallet per period
- Handling, per pallet, carton, shipment (inbound / outbound)
- Administration, per order / shipment
- Specified VAL activities

Management information: lay-out and information to be provided by the warehouse owner on

- Stock level reports
- Performance reports
- Invoices from the warehouse owner to the principal

Miscellaneous:

- Payment conditions
- Settlement of complaints and disputes
- Validity of contract
- (Limitation of) Liabilities of contract partners
- Applicable conditions / legislation

Test Questions

Please decide if the following are true or false:

The warehousing contract should contain among others the following points:

- | | |
|---|--|
| T | Detailed Goods description |
| F | Mode of delivery |
| T | Price |
| F | Delivery Term (e.g. FOB, CIF etc.) |
| T | Requirements for management information. |

9.18 Types of Warehouses

Learning objectives

The student should understand the various types of warehouses, defined by the type of logistics services, the type of users, or the status of the goods.

Type of logistics services

3 warehouse types can be defined:

transport centre, distribution centre, logistics centre.

The Transport Centre

A shipper can present a number of goods to a transport centre for shipment. The transport centre will then take care of the transport, which means that the shipper will have no say over the transport company that was employed. Coordination and planning of the transport will also be handed over to the transport centre. Remuneration will be based on distance covered, combined

with the amount of volume and weight that was carried, as well as the means of transport that was employed.

In most cases a shipper will only embrace a transport centre when he doesn't have a full truck load or full container load to carry. The leasing of an entire freight truck or container for a single shipment would prove to be extremely expensive.

The transport centre does not usually perform the carrying itself. Permanent contracts are closed with transport companies to this end. With the law becoming more flexible regarding the consolidation of different shippers' goods that are intended for individual transport companies, these companies will increasingly assume the role of a transport centre. Transport companies often combine this function with the outsourcing of transport to their colleagues.

The Distribution Centre

When a distribution centre (DC) is involved, all goods will be controlled by that distribution centre. In other words, the DC will not only be responsible for transport, as is the case with a transport centre, but also for receiving, storage, order processing, loading and dispatch. The DC will even be prepared to accept responsibility for stock control, as long as it's compensated. As a result, both the administration and replenishment of the stock will eventually form part of the distribution centre's duties.

Remuneration for these kinds of activities is done based on the total amount of distributed packages and following an Activity Based Costing approach. The level of remuneration will depend on the quality of the service delivered. It is obvious that a lower tariff will be levied if the storage and shipment of goods are the only requirements, while the opposite is true when stock control is included.

Similar to the transport centre, the DC doesn't perform the carrying itself, but prefers to delegate it to the transport companies.

The Logistic Centre

When a shipper has instructed the logistic service provider to perform the entire spectrum of ordering and invoicing, it becomes a "logistic centre." The implication for the logistic centre is that it will perform this function, including all those, as mentioned before, that belongs to a distribution centre. The shipper may or may not issue the orders via a computer network in the logistic centre, after which the logistic centre will see to the entire execution of the order in person. It will even become possible for the shipper's clients to place orders directly at the logistic centre. The logistic centre will of course keep the shipper informed of the orders that have been processed. A

logistic centre can also occupy itself with the transformation of products according to country or client specifics, e.g. adding directions for use in a specific language or adding specific guarantee stipulations. A logistic centre may also be required to include additional resources, extra parts, etc. for a specific client. In contrast to a distribution centre, a logistic centre can also take care of supply and even procurement on the shipper's behalf.

Remuneration for these activities is determined individually. Most of the time, these kinds of activities are performed in conjunction with a long-term contract between the shipper and the logistic centre. The logistic centre also out-sources transport.

Type of users

A warehouse managed by and catering for the goods of the shipper himself is called a private warehouse.

2 other types can be defined: public warehouse and dedicated warehouse.

Public Warehouse

When the entire or part of the storage space in a supply chain is outsourced to a professional third party, it is called *Public Warehousing*.

A public warehouse performs (part of) the physical distribution on behalf of more than 1 other company.

Dedicated Warehouse

When a company performs the physical distribution for one patron only, we are referring to *dedicated warehousing*. A dedicated warehouse is also known as a "company-related" warehouse.

Status of the goods

If goods are to be stored according to customs regulations, the following types of bonded warehouses exist:

- Bonded warehouse type B;
- Bonded warehouse type C;
- Bonded warehouse type D;
- Bonded warehouse type E.

Apart from the bonded warehouses, goods can also be moved to areas that offer temporary storage space. These storage spaces are perfectly acceptable to customs. They also control the transport documents. The storage period for maritime goods is usually limited to 45 days and 20 days for non-maritime goods.

Bonded warehouse type B is a public bonded warehouse where the person in possession of a storage document will be responsible for the stored goods and not the person in charge of the bonded warehouse. Type B was previously known as a stevedore warehouse.

Bonded warehouse type C has 3 variants:

- **Bonded warehouse type C with immediate stock administration**
In this type of bonded warehouse, the holder of a storage document and the person in charge of the bonded warehouse is the same person. Administration is expected to follow the goods from start to finish.
- **Bonded warehouse type C with specific stock administration**
Contrary to the immediate type of administration, the receiving and dispatch of goods is performed upon completion of the appropriate documents. A similar kind of bonded warehouse can basically be established anywhere, while one with an immediate administration function should be situated at predetermined loading and discharging locations.
- **Bonded warehouse type C with limited administrative control**
The most obvious feature in this case is the fact that goods, which are meant for import, can be distributed without having to wait for import declarations that usually have to be submitted in advance. Since the person in charge of the bonded warehouse is the same person as the one in charge of dispatch, he may prepare the documents that are necessary to perform dispatch. The stock administration will generate monthly declarations.

Bonded warehouse type D is a variant of C (with limited administrative control), where the customs value and the amount of goods are determined once the goods are received.

In bonded warehouse type E receiving will not require any documents for goods that have been labelled as imported consumables. Documents are only drawn up during implementation.

Last but not least is the open bonded warehouse. This is an area where goods can be stored for third parties, where there is permanent and official supervision present and where a limited amount of administration is performed in relation to the receiving of goods, the current location of the goods in the warehouse and dispatch.

Test Questions

Please decide if the following are true or false:

The warehousing contract should contain among others the following points:

- T A transport centre undertakes the coordination and planning of transporting goods.
- T If a warehouse stores goods according to customs regulations then we call this a “bonded warehouse”.
- F In a bonded warehouse goods are only allowed to be stored for which customs duties must be paid.
- T Bonded warehouse type B is a public bonded warehouse where the person in possession of a storage document will be responsible for the stored goods.
- F A public warehouse is a warehouse dedicated to one customer.

9.19 Warehouse Documents, Equipment and Systems

Learning objectives

The student should understand the characteristics of the main (FIATA) documents applied in warehousing.

The student should understand the main activities in warehousing.

The student should have knowledge of the main equipment and systems used in warehousing and the situations for application.

9.19.1 Warehouse documents

Learning objectives

The student should understand the characteristics of the main (FIATA) documents applied in warehousing.

The main documents in warehousing and their applications are listed below.

Document	Application
Waybill	Arrival check on loading units etc., to release the transport company
Packing list (from vendor), Procurement note	Arrival check on delivered / procured part numbers & quantities
Location form	Registration of storage location
Order form, Picking list	Retrieval from storage location, Instruction for order picking
Packing list (from warehouse)	Departure check on dispatched / invoiced part numbers, quantities
Waybill	Departure check on loading units, transferred to transport companies

Most of the internal forms will be replaced by electronic information, due to the application of computerised systems, bar-coding or radio frequency identification.

FIATA documents

FIATA has implemented 2 documents related to warehousing:

- FCR – FIATA Forwarders Certificate of Receipt read Module 1.7.2
- FWR – FIATA Warehouse Receipt read Module 1.7.4

Test Question

Please link the correct description to the Document

Document	Application
Waybill	Arrival check on loading units etc., to release the transport company
Packing list (from warehouse)	Departure check on dispatched / invoiced part numbers, quantities
Forwarder Certificate of Receipt	official acknowledgement that the forwarder has assumed responsibility for the goods
FIATA Warehouse Receipt	use in freight forwarders' warehousing operations, mainly used at national level
Waybill	Departure check on loading units, transferred to transport companies

9.20 Warehouse Activities, Equipment and Systems**Learning objectives**

The student should understand the main activities in warehousing.

The student should have knowledge of the main equipment and systems used in warehousing and the situations for application.

The activities inside a warehouse can be divided into different departments, i.e. receiving

- storing
- order generation / processing / picking
- dispatch

Reception

Warehouse duties commence as soon as goods are received. The ensuing activities can be identified as:

- discharging supplied goods
- inspection of goods as they enter the warehouse
- storage preparation for the goods

The activities that belong to the “receiving” section, may vary between companies. Sometimes different discharge methods and other support or transport resources are employed. In some companies the warehouse manager may be responsible for a particular activity himself or may be required to perform a particular activity on his own.

The discharging of goods is preceded by many activities.

Upon arrival, the driver should report to the person in charge of this section.

The incoming shipment will then be recorded in a register (computer).

The procurement department can use the information in this register to control whether the goods have been supplied on time. The driver will be informed, upon arrival, of the location where the goods should be discharged. All goods that enter the warehouse should be inspected. Three aspects are important when goods are controlled, i.e.:

- the amount of goods (related to the procurement order);
- the condition of the packaging;
- the contents of the packaging.

When the amount of goods is inspected, it is called quantitative control. When the condition and the amount of the packaging are controlled, it is called qualitative control. Qualitative control monitors the quality of the supplied goods.

In case of any irregularities, the following steps should be taken. Firstly, a description of what went wrong with the shipment should be recorded on the transport documents. The next step will be to find out what to do with the goods. Should a portion of the goods be stored, should an entire batch be put on hold, or should one part of the goods be transported to an area for damaged goods? The patron, as owner of the goods, will have to be informed of course. The patron should indicate whether an expert should be summoned to judge the extent of the damages, or whether specific duties, e.g. repacking of the goods should be performed. It is obvious that administration will have to be very accurate when the status and the location of the goods are recorded and processed in the stock control system.

The Receiving Area

The receiving area is the area where the goods are received and stored temporarily. The location, size and arrangement of the receiving area are determined, amongst others, by:

- the means of transport that has delivered the goods;
- the amount of goods that was delivered;
- the frequency of delivery;
- the type of goods;
- the equipment that was employed during discharge;
- the location and environment where the building was set up;
- the intermediate storage.

The receiving and shipping (dispatch) of goods can either be performed in the same area, or in separate ones.

Discharge location and provisions

Goods that arrive at a warehouse should be placed somewhere. A specific area is usually allocated for this purpose, i.e. the discharge location. The discharge location may have been provided with a variety of items to simplify the process of discharging. These items may take the form of loading boards, lifting tables and mobile ramps.

When the discharge location is provided with these items, it could imply a number of advantages and disadvantages.

Advantages:

- immediate and efficient discharge will be possible;
- the items that were provided will allow discharge to be performed without the assistance of any external means of transport;
- the discharge activities can be performed under improved circumstances;
- the risk of goods being damaged during discharge, is smaller.

Disadvantages

- financial support will be required in order to provide the items;
- the items do not always suit all means of transport.

During discharge, a height difference between the warehouse floor and the loading platform of the truck should be abridged. This height difference can be overcome in many ways. It can be achieved with a loading platform and/or by using other supplies, such as:

- loading pits;
- loose or assembled loading boards;
- lifting tables;
- (mobile) ramps.

Dock shelters and dock levellers

These structures will ensure that the loading and discharging of trucks is conducted as quickly and as safely as possible.

A dock shelter is a support structure that is used to seal the loading door. In this way, the driver and the warehouse assistant will be protected from wind, rain and cold during loading and discharging.

A dock leveller is a support structure that is used to bridge the gap between the loading platform and the truck, and to eliminate the height difference between both.



Loading pit Pallet truck driving on dock leveller

Discharge equipment attached to and inside freight trucks

If a freight truck is equipped with tools designed to assist with discharge, discharge can be performed regardless of what the local situation may be.

The driver of the truck can perform the discharge himself, when and where he requires, by using:

- tail lift;
- transporters;
- lorry mounted crane;
- portable stackers.

Preparing goods for storage

Sometimes the condition of the packaging in which goods are received, does not make them suitable for storage. Goods often need to be repacked. Seeing that packaging requires time and money, the supplier is often urged to supply goods in the proper (storage) packaging.

Goods can be sorted during or after discharge, at which time the goods will be transferred to an area for temporary storage. The packages can be sorted according to type and/or storing method.

Should the items be provided with sufficient information, it would improve the speed and the efficiency with which these duties are performed. If the supplied goods don't contain any information of this kind, the receiving department will have to provide the goods with the information.

This information may include:

- item code;
- storage location;
- handling instructions.

An article code is a brief, straightforward description of an item. It may include numbers, letters or a combination of the two.

A location number will designate the storage location. The location number will clearly specify where the item should be stored.

Some goods will be treated quite differently to others. Pictograms are used to clarify specific handling instructions.

There are two types of pictograms:

- Labels with handling instructions;
- Labels indicating danger.

Storage

The manner, in which goods are stored, depends largely on the type of goods and the flow of goods. Information should be gathered relating to:

- the measurement of the goods (small, large or long etc items?)
- the format and condition of the goods (is it general cargo or bulk goods?)
- are the goods in solid, liquid or gas form?
- the nature of the goods: what is its weight? / how high is the risk for damages?
- the amount of goods (how much space will it occupy in relation to gross and net warehouse space and gross and net storing capacity?)
- the frequency with which supplying and dispatching is performed;
- the stock rotation speed;
- how it was supplied and will be distributed;
- particular features of the goods (can the goods be stored outside / does it involve dangerous substances / high value / palletised goods?)

Warehouse stock can be divided into bulk stock and active stock. The orders are generally gathered from the active stock. The active stock is replenished from the bulk stock.

A storage system should be chosen with great care. Matters such as the space- the staff utilisation should be considered, as well as the ease with which goods can be accessed.

Location systems

A location system specifies exactly where an item should be stored in a warehouse. This system aims to store and remove goods from storage, in the most effective manner possible.

Location systems can be divided into:

- permanent placing (each item is stored in the same place in the warehouse, all the time);
- random placing (an item can be stored in any place that happens to be vacant at the time);
- semi-random placing (some items are always stored in the same part of the warehouse; whereas others are stored in vacant areas that are available).

Advantages of random placing:

- effective use of space;
- flexibility;
- not many open / vacant spaces.

Disadvantages of random placing:

- the burden of keeping an accurate administration system;
- having to walk to and from during the order picking.

There are five possible storage location systems to choose from: the item code system;

- the location system;
- the group system;
- the project system;
- the section system.

The Item Code System

In order to prevent confusion items are supplied with number or letter codes or with a combination of the two.

Firstly, the code prevents mistakes and secondly, it ensures effective internal communication. At administration, a code instead of a description will suffice. The item codes can act as support for the storage system. The items have been arranged according to specific classifications and can therefore be stored by using these as a guideline. The process usually starts with the lowest code and finishes with the highest.

Disadvantages:

- quite often an established route has to be walked through in its entirety;
- no distinction is made between fast and slow moving goods, heavy or light items, etc.;
- the sequence should be maintained, regardless of how much stock is present;
- when products are added or removed, the system must be adjusted.

The Location System

There are two location systems available:

1. the random location system;
2. the permanent location system.

The Random Location System

This storage system does not allocate a specific place in the warehouse to items. In other words, items may be stored in any available space.

As a result, the level of replenishment is high and may rise to 90%.

A very accurate stock system will be required for this purpose.

The administration for the stock system is usually done by a computer

system where the amount, product, processing date and location, among others, are recorded. During dispatch, the computer provides an estimate of the items that should be supplied according to the FIFO-system. (First In First Out, giving priority to the dispatch of the oldest items / lots).

This usually occurs with a dispatch order.

The Permanent Location System

This storage system reserves a permanent place in the warehouse for every item. This location system is implemented to store active stock most of the time.

The *advantage* of the permanent location system is that goods are easily stored and traced.

Disadvantages:

- more walking/driving time is spent on storing and gathering orders;
- inadequate utilisation of available space;
- there are vacant locations if items are finished or, insufficient location space when a sudden increase in demand occurs.

The Group System

In a group system goods are stored in groups. The goods will consist of items that are related to each other (e.g. tables, chairs).

By storing goods in groups, unnecessary walking will be prevented. This system could become very useful when used in combination with a permanent location system. The level of occupation is not extraordinarily high and will not exceed 45%.

The walking distances in the group system is also smaller.

The Project System

In the project system, the items are also stored in groups. In this case, the groups are composed of items that are all connected to the completion of a specific project. The assembly of a specific apparatus comes to mind.

The question that should be asked is: "Does it involve the same projects, or various projects?"

The Section System

The Section storage system is usually applied where a large variety and sudden decreases are implied. The warehouse will be divided into sections, as a result. The amount of sections will depend on the size of the company. One section will contain the item groups.

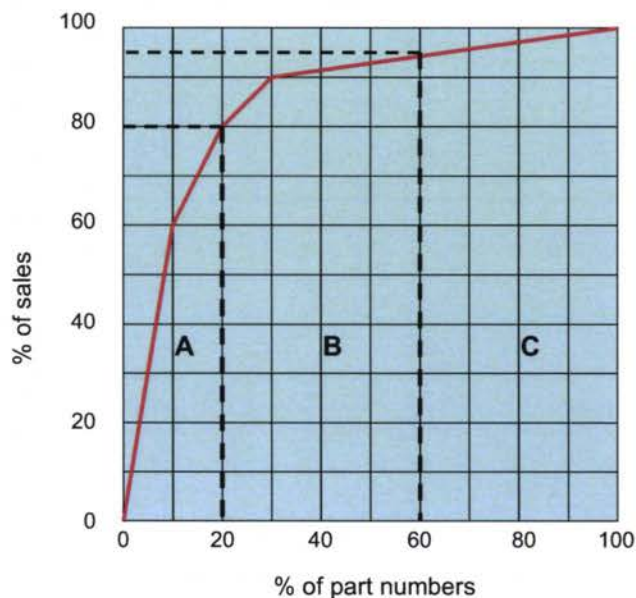
Order gathering can be done by walking through all sections, or by splitting the order. In the latter, the different parts of the order will be taken to the section where the required goods are stored. The section system will often be employed in combination with another storage system, e.g. the permanent location system.

The storage systems can be used in combination making it possible to store goods according to one storage criteria. Goods may be stored in accordance with:

- demand frequency;
- amount of turnover;
- physical attributes;
- assortment composition.

An important tool to analyse the demand frequency or to determine the item's contribution to the total turnover is the *ABC analysis*.

A typical result of the ABC analysis is that only 20% of the items together contribute to 80 % of the sales (in volume or in money). The fastest moving group of items is called the A category and should receive the most attention in the location system in order to reduce walking / driving distances in the warehouse.



As with transport, the place where goods are stored has a great deal of resources at its disposal. Sometimes resources can be employed by both storage and transport. A few of those are transport crates, pallets, box pallets, rolling containers, storage means for gases, liquids and bulk goods.

Each storage medium has its own advantages and disadvantages. It is not always true that one medium might be better than another. Storage mediums are only, as with means of transport, more or less suited to a specific type of warehouse or to specific types of goods.

The situation will determine the medium that will be employed.

Order processing and order picking

This process contains the following steps:

- - arrival of orders (how, accuracy, solvency);
- - processing of order documents ;
- - preparation of picking list (accuracy, comprehensiveness);
- - order picking;
- - calculation of stock level;
- - financial processing;
- - shipping;
- - stock replenishment.

Receiving orders

Orders, that are meant initiate certain actions inside the logistic centre, can be generated in different ways. Orders can be issued by fax, mail, telephone or electronically.

When one of the methods is selected, it will most probably be based on the type of work that a logistic centre handles, together with the priority of the patron and the kind of order. The kind of order refers to supply, reception of goods, storing, order picking, labelling, packaging, dispatch, distribution, international transport of part loads or complete loads, etc.

Most of the time a logistic service provider will only accept written orders, because this method will allow a uniform set of procedures to be followed at all times, which will enable the company to run smoothly and productively. When goods have not been reported at arrival, the aforementioned won't be realised. Waybills, consignment notes, packing lists etc. will be the starting point for following activities.

With ad hoc-instructions and unspecified procedures, more mistakes are made more often and nobody really knows what is going on. The calculation of and responsibility for stock also requires well-documented procedures. By establishing controls at specific points, it would be possible to measure any

achievements in this area.

A relatively small number of activities can be found at smaller patrons and some duties can even be performed based on orders that have been received by fax. The costs will be quite significant. Automated solutions may be implemented quite successfully, but success will depend on its usefulness to both service provider and patron.

Order processing

When processing is entirely manually performed, the receiving and processing of orders will constitute 50% of the total time cycle. Even a small improvement, e.g. the automation of routine tasks, may have a considerable effect on the total time cycle. Even limited expenditures will result in highly improved service levels.

It would be advantageous to a service provider to receive his instructions electronically, e.g. orders can be processed via a processing system, producing order picking lists (including barcode labels, stock adjustments, waybills, faxes with pre- advices to destinations, connections with automated systems for customs declarations or to generate documents).

When the abovementioned applications are fully operational in a company, manual adjustments and orders will only slow it down. It is however important that the processes should still be controlled manually. When the larger logistical service providers or the European distribution centres started implementing the almost fully automated stock control and stock management systems, it was total chaos. In order to continue supplying the orders, manual intervention was required. It caused long waiting periods for the carriers and it was impossible to tell how many items would be supplied to which destination.

It is therefore essential, that similar operations retain their ability to be executed manually, in case of emergency.

Example:

A closer look at the order processing will reveal the significance of the order picking document, especially in companies that store a complex variety of stock items.

Special consideration should be given to stock keeping and the distribution of larger volumes of products and parts. Terms such as 'family grouping, the picking of orders in batches, etc.' will be illustrated with an example.

A fictional company with two clients can be used as an example. The company will supply consumer products to European country organisations and other intermediaries on behalf of the first client and supply a limited number of different and complex end products with spare parts kept in stock for the other client.

Consumer products arrive in large quantities and are then stored. The larger quantities are stored in the open (not on racks) and smaller products, as well as the non-stackable products and the slow-moving items are stored in racks. Since items are stored for international organisations, they are usually dispatched again in large quantities, involving multiple pallets of the same product or entire trucks.

Specific shipments are also order picked, either to small countries, or because the clients have placed their order directly. Storage for spare parts such as vertical rotating racks and shelf racks will be most appropriate, where complicated machines could either be placed in racks or on the floor.

Usually, a few days will elapse between order receipt and shipment. Apart from order picking during this time, transport will be ordered and the documents or the declaration will be prepared.

Orders for consumer products can be picked per shipping instruction, to enable that goods can be put in order in the despatch area for checking the type and number of items. When a specific product group is picked to satisfy multiple orders, this is called order picking in batches.

This might prove to be the most suitable method to compile an order, especially when the different product groups require different equipment (pallet truck, lift truck, clamp truck), increasing the utilisation of the equipment and the efficiency of the staff, reducing waiting times

If the same type of goods is stored together, it is called family grouping. It differs somewhat from a distinction into fast / slow movers, positioning similar products close to each other, in order to improve stacking patterns during order picking. Due to the large and mostly palletised volumes of incoming and outgoing goods, a mechanised order picking system will not be a very cost-effective solution in this case. A very popular method that is being employed for stock keeping purposes these days (ordering level, production management) is that goods are scanned during dispatch.

By capturing the barcode information, it will become obvious where which products can be found in the logistical pipeline. It is complicated, however, by the fact that only 1 or 2 links capture the information and that too many producers/manufacturers are still using their own barcode systems.

When consumer products are distributed directly to the dealers (retailers), each product's destination should be captured. Apart from the fact that it will allow items to be traced directly, there is a great deal of marketing information which could prove valuable in the future and for this reason, standard barcodes became the norm and could therefore be employed throughout the supply chain.

More complicated end products with spare parts, are part of the following situation; Spare parts will have special priority for shipment because they

intend to replenish a local emergency- or picking stock due to a defect. The processing time between receiving and dispatching the order should, preferably, be very brief.





Transport may also benefit from short processing time. For example, there may be a distinction in the kind of order: stock replenishment (normal completion, normal shipping, normal costs), or a rush order where the cost implication of a standstill might be much higher than the transport costs of a courier. Due to the complexity of the parts and the significance of accurate supply, it is extremely important that this information be captured accurately.



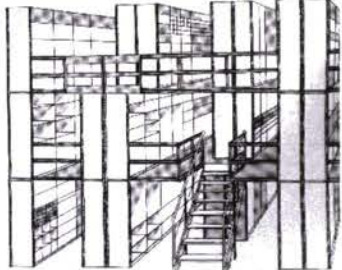

“How many parts do you have in stock; when are new supplies going to be ordered; where are they located exactly?” are questions that only automation could answer and on which the correct decisions could be based.

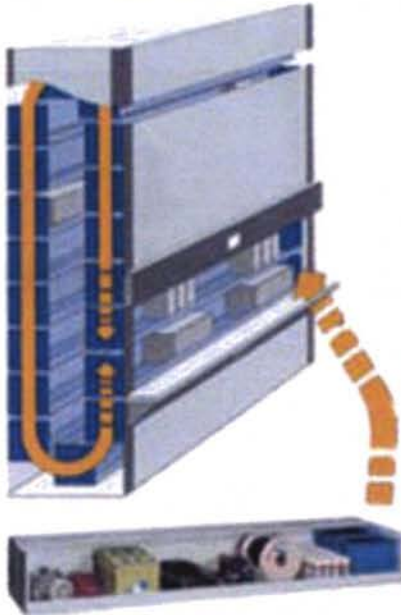
The complicated machines will be picked and shipped according to regular orders, unless complete units should be replaced and if the same amount of urgency is required as that for the spare parts. It will be decided based on predetermined criteria, whether to supply a similar machine e.g. by employing consolidated road transport or by using a special truck.

The use of barcodes is expensive, because the smaller volumes also enable the manual capture of information. Uniform data capture is however still important and since the implementation costs are decreasing, more frequent application of this technique will be seen.

Storage media	Types
Dynamic storage media	Pallets, crates, tanks, containers, crates
Static storage media	Racks

Types of racks	Application	
Pallet racks	Universally applicable to all palletised goods.	 <p>Wide aisle concept</p>  <p>Narrow aisle concept</p>
Drive-in and drive-through racks	Specifically meant for the storage of bulk stock (large lots). The application of this type of racks will only be meaningful if the stock is made up of more than one pallet load per item.	
Cantilever rack Insertion rack	Mainly intended for long shaped goods To store goods of considerable length. Differ from the cantilever racks in that the gathering of orders is done at the short side of the goods.	


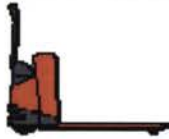

<p>Live rack / drive through rack</p>	<p>A storage method with temporary internal transport. The application will be meaningful if more than one (pallet-) load is available per item</p>	
<p>Mobile racks</p>	<p>The application of the mobile racks will result in high storage density, without having too much stock on hand per item. The mobile construction can be applied to a pallet racks, cantilever racks and shelf / compartment racks.</p>	
<p>Shelf / compartment racks Drawer chest</p>	<p>To store small parts or small amounts of an item. For very small items or limited amounts of items.</p>	
<p>Block stacking</p>	<p>Storing method without the use of racks, for goods that can be stacked safely on top of each other</p>	




Rotating racks	Lately, rotating racks are being used more and more. Both horizontal and vertical rotating racks exist. These systems move the locations to the insertion / retrieval point, thus reducing transport distances of warehouse staff.	
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Internal Transport Equipment

Means of transport can be divided into mobile and stationary types. Additionally, they may be motorised or not. If they are motorised, it will most probably be because of a motorised power source, e.g. the electro-motor. The electro-motor is usually provided with a traction battery. This battery runs down with frequent use and should be recharged regularly. Recharging is usually performed in a specially allocated area, i.e. the battery charging station.




A number of important matters should be considered when mobile transport media are employed. The first concern is the working area in the warehouse. The passages should be wide enough to ensure that the working environment is safe. Secondly, the means of transport that are employed in the warehouse should be monitored for stability. Thirdly, various opportunities pertaining to the lifting of goods should be considered. Some vehicles have been provided with a lifting mast allowing them to put goods away at great heights. In the fourth place, mobile vehicles may be equipped with pneumatic tyres, massive or semi-pneumatic tyres. When using these vehicles, one should stick to the rules. The degree of safety will be improved and eventually guaranteed, as a result.




Types of trucks	Application	
Stacker cranes	<p>These cranes travel through rack aisles, guided on the floor and on top by a rail or by induction. Stacker cranes may be connected to a central computer and operated manually, semi-automatic or fully automatic.</p> <p><i>Advantages</i></p> <ul style="list-style-type: none"> - aisle width reduced to 1.0 – 1.5 m., reducing floor space; - very high height reach; - great positioning accuracy; - the prospect of full automation; - rapid receiving and dispatch of goods. <p><i>Disadvantages</i></p> <ul style="list-style-type: none"> - inflexible system, not suitable for other warehouse operations; - since the telescope forks cannot reach the floor, the lower pallets should be placed at a minimum height of 30 cm. 	
Manual pallet truck, powered pallet truck;	Horizontal transport for shorter distances, loading / unloading small volumes	
Fork lift truck	Horizontal transport for longer distances, stacking, loading / unloading large volumes (highly flexible but space consuming)	

Reach truck	Transport and stacking in rack areas, reducing aisle widths from 4.0 to 2.7 m.	
Order picking truck, at floor level only	Case picking or loose item picking from racks	
Order picking truck, Also at higher levels;	Idem	

Stationary transporters

This transport equipment is applied where transport routes are fixed. Some examples are:

Type	Application	
Chute Screw conveyor Elevator Cargo lift table	Vertical transport	
Roller conveyor Wheel conveyor Conveyor belt	Mainly horizontal transport of cartons etc.	
Vibrating conveyor ; V-shaped conveyor; Pneumatic transporters	Mainly horizontal transport of bulk goods	



Overhead conveyer;	Transport of hanging items (production line, garments etc.)	
Floor chain conveyor	Horizontal transport of wheeled containers etc.	
ADV – Automatically Directed Vehicle	Horizontal transport, with electronically guidance in floor, without manual interference	

Test Questions

Please decide if the following are true or false:

- T At the receiving section in a warehouse goods inspection takes place.
- F The most important storage information placed on a consignment is a detailed description of the contents.
- F Fast moving goods should be stored in the highest position of the shelf.
- T Order picking lists are necessary information for the warehouse personnel to collect different goods from the warehouse and to consolidate into outgoing consignments.
- F FIFO stands for Federation of International Forwarder Organisations.

Connect the correct description with the correct picture

<p>Roller conveyor for parcels and boxes</p>	
<p>Forklift Truck</p>	
<p>Floor chain conveyor for wheeled containers</p>	
<p>Truck docking door</p>	

9.21 Construction, Lay-out and Safety

Learning objectives

The student should understand the main factors determining the warehouse location.

9.21.1 Choice of location

Learning objective:

The student should have a general idea about the main factors influencing the warehouse location.

To determine the optimal location for a warehouse many factors must be analysed:

- inbound / outbound goods flows;
- the distance to the majority of the sources and the clients;
- land / warehouse costs, inbound / outbound transport costs;
- employment market, social / political stability, tax incentives etc.

In general, lower value commodities will be stored relatively decentralised, close to the clients; higher value commodities will be preferably kept in a centralised warehouse, since their inventory costs are relatively high.

Also transport modalities are important: an international trading company applying containers for their inbound and outbound goods flows may preferably locate its warehouse close to a major container terminal; a European Distribution Centre for high tech spare parts will be located near a major airport.

Many companies from e.g. USA and Japan, distributing their goods all over Europe, have decided to locate a European Distribution Centre in Northwest Europe (due to the above mentioned factors). The recent rapid development of the economies in Eastern European countries hadn't changed this policy until now, although an increasing number of satellite warehouses have been erected in these countries.

Test Questions

Please decide if the following are true or false:

Main factors for the location of a warehouse are:

- T inbound / outbound goods flows;
- T the distance to the majority of the sources and the clients;
- F availability of technical equipment
- F landscape
- F access to public passenger transport
- T land costs

9.22 Construction, relative sizes and lay-out

Learning objective:

The student should gain a general idea about the main aspects of the warehouse layout.

In order to create a good quality warehouse, there are many aspects to consider. The following can act as a framework to specify the main aspects that should be taken into account.

- module size (position of columns);
- storage height, free lifting heights;
- measurements of specific areas (reception, dispatch, storage);
- number of (un)loading docks, dimension of bays;
- construction type;
- choice of storage- / handling equipment, conveyors, sorting installations;
- permitted floor loads, finishing;
- office requirements;
- local fire safety regulations / specifications, environmental legislation;
- provisions for dangerous goods, cold stores etc.;
- customs specifications, etc..

The required investments and operational costs will be determining factors in the decision on which option should be chosen.

To find the optimal solution for a specific warehouse, a detailed analysis should be made of:

- the inbound / outbound goods flows;
- the numbers of items to be stored, storage duration;
- technical storage / handling requirements of the goods;
- order processing, required service levels (order lead times), etc.

The analysis should also include future projections, to ensure that the set-up is flexible to changes in volumes, type of commodities, storage duration etc. Changes in these figures may have a large impact on the required number of docks, required storage areas and therefore on the total warehouse lay-out.

Low warehouses with wide aisles may be space consuming but are flexible and applicable for low volumes; all (un-)loading, transport and stacking can be done with the same forklift trucks. High warehouses with narrow aisle systems reduce space costs; although the investments in floors, racks and transport equipment will be much higher, so these options are only suitable to higher business volumes – and the flexibility towards future changes is much less.

Many public warehouses have a set-up which can easily be adapted to changed goods flows (free height 10-12 m., sufficient docks, conventional block stacking area + pallet racks, aisles of ca. 2.70 m. for reach trucks, etc.).

Test Question

Please decide if the following are true or false:

- T Low warehouses may be space consuming but are flexible
- T High warehouses reduce space costs
- F Public warehouses usually have a height of 5m
- T Public Warehouses usually have a height of 10 – 12 m
- F Public warehouses usually have a height of 5 – 8 m
- F A conventional block stacking area is no longer necessary in modern warehouses.

9.23 Safe working practices and fire prevention

Learning Objective:

The student should have some general knowledge about safe working practices and fire prevention in warehouses.

Safety measures in the storage area

The most common dangers in the storage area are surroundings, fire, explosions, poisoning and suffocation.

Staff working in the warehouse should be acquainted with all the imminent dangers. They should receive training on the implementation of safety measures, with specific reference to the handling of dangerous goods, fires, explosions or casualties.

Staff should be trained in the proper use of all warehouse equipment.

Pedestrian and driving areas should be clearly separated and marked; crossing traffic should be avoided. Emergency exits should be clearly visible and marked.

Appropriate, good quality clothing and shoes is very important for people,

especially if working in cooled and refrigerated areas. Clothing should, of course, provide adequate isolation against wind and moisture, but should also be practical and comfortable.

Warehouse floors should be treated to avoid slippery.

Confinement

To be confined in a cooled or refrigerated area can be very dangerous. Precautionary measures have been put in place, in order to prevent this from happening. Most importantly, an effective inside light should be fitted that cannot be switched off from the outside (quite often a signalling lamp on the outside will be connected to the inner lightning).

Emergency exits that can open from the inside and from the outside should be constructed. These emergency exits should obviously be kept free and be indicated clearly.

Communication with the outside world will be essential (telephone, intercom or alarm buttons). Many cold stores are now equipped with closed television circuits.

All these precautions should remain functional when electricity supplies are unexpectedly interrupted.

Fire and Explosions

In order to prevent fires and/or explosions in the stores, a few precautionary measures should be taken. For example, no smoking or open fires should be allowed in storage spaces. These regulations should be indicated properly using signs.

All staff should be trained in the use of fire extinguishing equipment; this equipment should be regularly maintained and tested.

All electrical installations should be maintained well and expertly, and be kept "*fire- and explosion-free*". Liquids, of which the vapour alone might be dangerous, should be stored in the appropriate areas.

Most stores are equipped with smoking-/gas warnings. In cold stores, these warnings should be able to withstand low temperatures. If there is a fire, everyone should leave the area, ventilators should be switched off and the fire extinguished.

Not all fire-extinguishing equipment is suitable. Installations containing CO₂ will not be suitable; the area would be filled with carbon dioxide (suffocation). Even so-called sprinkler- installations cannot be relied upon in cold stores. Additionally, there are fire- extinguishing substances that can form explosive or poisonous vapours when mixed with cooling agent.

Dangerous Goods

The storage of dangerous substances is subject to the guidelines as set out by

the CPR Commission. Guidelines CPR 15-1, CPR 15-2 and CPR 15-3 contain valuable information for the warehousing section.

CPR 15-1 focuses on storage locations where dangerous substances between 25 kg and 10 tons can be kept.

CPR 15-2 is applicable to storage locations with capacities of more than 10,000 kg.

CPR 15-3 targets at companies that consume / trade in pesticides.

The aim of the CPR-guidelines is to minimise the risk of casualties. It may be accomplished by:

- storing a group of materials that could carry a high-risk factor, separately;
- ensuring that the necessary resources are provided for the quick detection and extinguishing of fires;
- arranging for the storage of fire-extinguishing water and –products;
- educating the staff about the correct procedures to follow during incidents.

In order to achieve these goals, three levels of protection have been determined within the framework of CPR 15-2. These levels are indicated in the table below.

Level 1	Level 2	Level 3
Automatic fire-extinguishing system		
Fire detection	Fire detection	
Storage fire-extinguishing water	Storage fire-extinguishing water	
Product spill storage	Product spill storage	Product spill storage (in certain occasions)
Preventative measures	Preventative measures	Preventative measures
Equipment specifications	Equipment specifications	Equipment specifications

The specifications that are set for CPR 15-1 corresponds closely with protection level 3 of CPR 15-2.

In terms of an automatic fire extinguishing system, a sprinkler or a foam system could be considered. Fire-extinguishing water is stored in reservoirs that have been laid out under ground or in tanks that have been established outside the storage location. A popular tendency seen for the storage of chemicals at the building site of new warehouses these days is that open spaces are created underneath the scaffolding in order to store the goods.

As a result, waste from fire-extinguishing mediums and chemicals can be removed in a manner that benefits the environment.

Trade companies may consider this as an opportunity to outsource the storage of similar dangerous goods to a logistic service provider who is

specialised in this field, instead of making an attempt to offer adequate shelter.

Test Question 9.11.3:

Please decide if the following are true or false:

- T The warehouse architect should try to avoid transport crossings.
- F Emergency exits need not be marked if there is an exit door is every 5 metres.
- T Warehouse floors should be treated to avoid being slippery
- F If the warehouse workers are trained in fire prevention then they are allowed to smoke within the storage area.
- T The CPR commission specifies 3 levels of warehouse protection

9.24 Debit of Warehouse Charges / Rent

Learning objectives
The student should understand the main principles of activity based costing.
The student should understand how warehouse tariffs can be calculated, reflecting the performance supplied to a user of the warehouse services.

9.24.1 Activity Based Costing

Learning objective:
The student should understand the main principles of activity based costing.

The total warehouse costs are composed of different items, e.g.:

- Lease- or capital costs + operational costs of buildings and equipment;
- Direct labour costs for handling, administration;
- Indirect costs of management, overhead and systems.

Especially in a multi-user warehouse these costs should be properly attributed to the party who incurred the costs.

It would be possible to calculate the total annual costs, divide these by the total annual number of pallets flowing through the warehouse, to find a general price per pallet.

However, if one user stored his goods relatively longer, or caused more labour on reception, despatch or administration than another user, this should be reflected in higher warehouse tariffs. It should also be noted that these variables are not constant but may change or fluctuate over time.

Activity Based Costing is a way of attributing costs, calculated on the basis of actual costs per transaction. It is a very effective method that takes all these types of effects into account and that offers “honest” *cost prices per product (service)*, as a result. However, the quotation marks indicate that even Activity Based Costing is based on quite a number of arbitrary presumptions, which should be sorted out between the different parties, before it can be implemented.

To achieve tariffs which really reflect the warehouse performance, specific tariffs can be applied for different services, such as storage, handling, administration.

Test Question

Please decide if the following are true or false:

- T Activity Based Costing is a way of costs attributing to a certain product or service.
- F Activity Based Costing considers cost only, which can be allocated to a certain product or service directly, e.g. loading/unloading time etc.)
- T Activity Based costing gains more importance with multi-user-warehouses.
- F Tariffs should be equal for all the users.

9.25 Warehouse tariffs

Learning objective

The student should understand how warehouse tariffs can be calculated, reflecting the performance supplied to a user of the warehouse services.

Warehouse rent (storage tariff)

From the lease- or capital costs + operational costs of buildings and equipment, a cost price can be calculated in EUR per sqm per day, or EUR per pallet location per day (if pallet locations have standardised dimensions). This cost price will be added with a surcharge to cover all indirect costs of management, overhead and systems.

This way each user can be exactly charged for the storage performance supplied to him: used space and time.

Warehouse handling fees and ancillary charges

The total direct labour costs can be calculated in a tariff per man-hour, also including a surcharge for indirect costs. The division of the indirect costs over storage and handling tariffs is arbitrary; e.g. the management costs could be divided based on the estimated % of management attention.

After analysing the required time for specific activities to be executed for each user, a specific tariff can be calculated per user, e.g. EUR per inbound / outbound pallet.

Ancillary charges can be calculated for VAL- activities etc.

Test Question

Please decide if the following are true or false:

- T The direct labour costs can be calculated in a tariff per man-hour.
- T Warehouse rent can be a price for storage in Euro/sqm * day or Euro/pallet * day..
- F Whether tariff per sqm or per pallet - the warehouse operator may charge the tariff which is the highest. This is the internationally recognized tariff in operators option principle
- T VAL means Value Added Logistics. .

9.26 General

Learning objectives

The student should understand the basic characteristics of Warrant storage, Consignment stores and Compulsory storage

Warrant storage

Many commodities are more or less perishable, which means that the product quality reduces over time. The manufacturer guarantees the quality during a certain period. This warrant storage period must be mentioned on the packaging. As long as the packaging has not been opened, the product could be kept until the “warrant storage life” has expired.

Depending on the perishability and the packaging there are generally two options:

- On highly perishable food products (e.g. meat, fish, vegetables) the indication “to be used before [date]” is mentioned.
- On less perishable products (e.g. canned food, paint) the indication “best before [date]” is mentioned. The manufacturer indicates a good quality until this date, if the packaging has not been opened in the meantime.

Consignment store

A consignment store is a retail store that stocks and sells merchandise on consignment.

The consignment store receives merchandise from a supplier, performs all storage, packing and other necessary logistics activities, and sells the merchandise for a percentage of the profits. All costs and risks related to the storage are for the account of the supplier.

A retail company running a consignment store would face less risk if it can fill its store with merchandise without paying for it until the merchandise has been sold.

Consignment store commissions are deducted from the final selling price and can total as much as 40%.

Compulsory storage

Compulsory storage is initiated by authorities, related to emergency situations.

As an example, pharmaceutical manufacturers and / or importers may be requested to stock certain pharmaceuticals and medicinal products and basic materials to prepare them, as well as packaging materials, for emergency situations. The companies will be compensated for this compulsory storage, although this compensation may be paid after the fact.

Compulsory storage may also concern other so-called "strategic" commodities, such as sugar, crude oil etc.

Test Question

Please decide if the following are true or false:

- T Warrant storage means that the manufacturer guarantees the quality of the goods for a certain period (perishable goods).
- F Perishable goods can also be consumer electronics in case.
- T A consignment store can reduce the capital in stock for the merchant.
- F The state compensates costs for compulsory storage.

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