

Andrea Chiarini

Module 2

Supply Chain Management

Supply Chain Management (SCM)

What is SC?



Seen as the '**big picture**':

- ✓ **Supply Chain** is the **integration** of all the **organisations and processes** involved in delivering a finished product to the customer

Seen from a **manufacturer's standpoint**:

- ✓ **Supply Chain Management** is the function that manages and controls all of the integrated processes within the supply chain; **it is part of the operations**
- ✓ Supply Chain Management comprises **Logistics** and they are strictly linked

Example of Supply Chain with different organisations (The 'big picture')



Raw materials supplier (Tier 2)



Semi-finished good supplier (Tier 1)



External suppliers



Customised/finished product manufacturer (final producer)



Wholesaler/Distribution Centre



Retailer

External distributors



Customer (E-Commerce)



Logistics involves the integration of processes such as **transportation, warehousing, inventory control, material handling and packaging**

In the past, SCM was related to the **management** of organisations and processes while **Logistics was more linked to the physical handling of products**

Logistics is about handling and controlling the **flow of goods**, but **also information** and other resources, between the point of origin and the point of consumption of the product in order to meet customers requirements

Logistics affects all the Supply Chain organisations and processes as well as the internal manufacturing processes of a specific plant
(**Production logistics or Internal logistics**)

Production Logistics or Internal Logistics

The term is used for describing **logistics processes within a plant or industry**. The purpose of production logistics is to ensure that each machine and workstation is being fed with the **right product in the right quantity and quality at the right point in time**

We will analyse production logistics in associations with the Toyota Production System - Lean Manufacturing – Just-In-Time (JIT)



SCM and Procurement

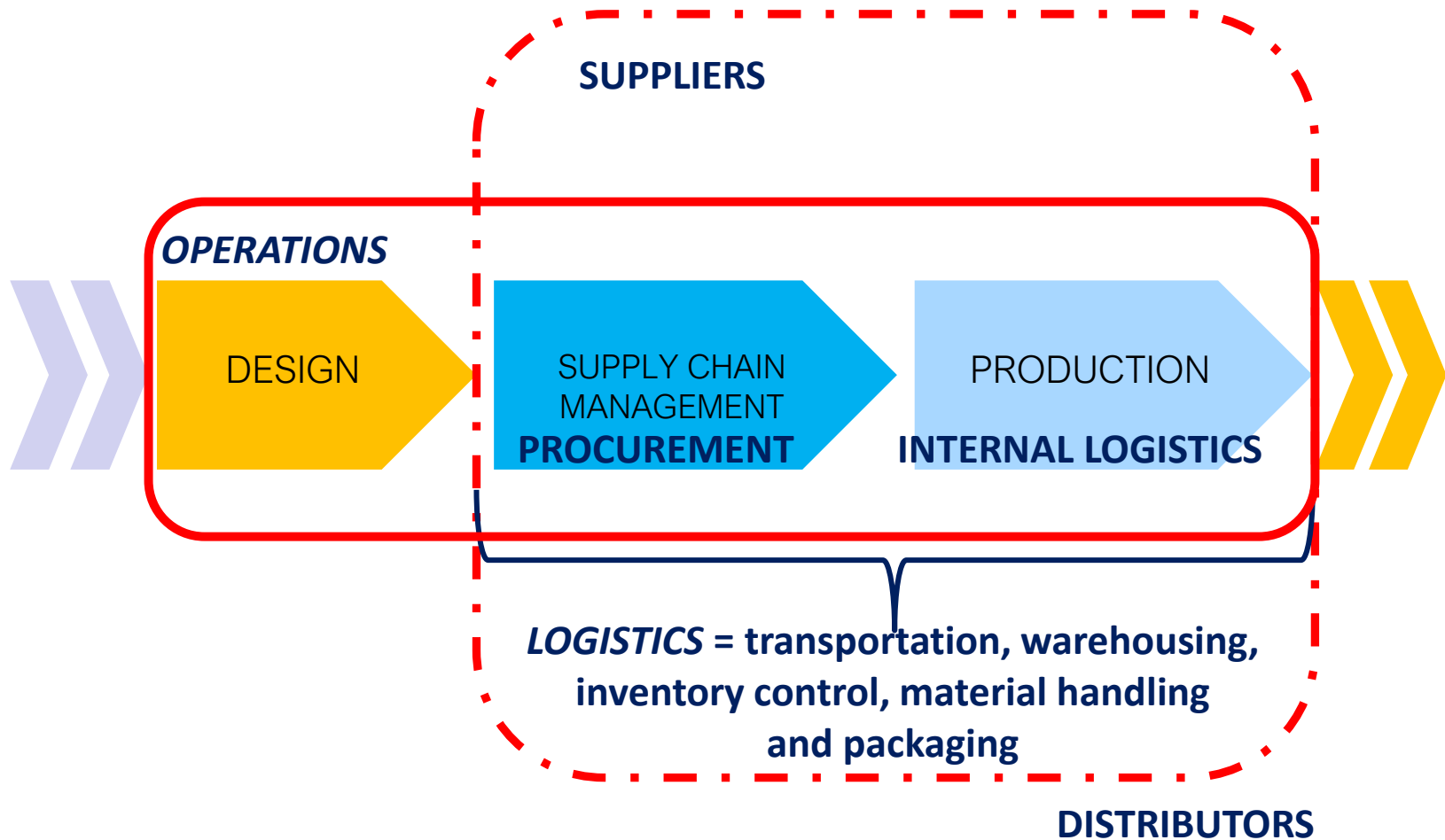
Often confused with each other.

Procurement is a part of SCM. Procurement is the process of getting the goods and services needed from a **documental/administrative** point of view. It can involve:

- Specifications determination
- Supplier research and evaluation
- Price negotiation
- Ordering and supply contract
- Supplier payment (Account receivable)



Operations, SC, Procurement, Production and Logistics



Supply Chain main organisations and processes

We can see things from the final producer factory

- ✓ **External Suppliers**— they supply raw materials and semi-finished goods (or provide services)
 - Tier one. It supplies directly to the final producer
 - Tier two. It supplies directly to tier one
 - Tier three It supplies directly to tier two
 - Etc.
- ✓ **SCM function**— Department that manages purchasing, supplier planning, incoming quality, shipping planning
- ✓ **Logistics function** – Department that manages internal warehousing, transportation traffic, material handling and distribution
- ✓ **External Distributors** – They transport finished products to appropriate locations

Obviously each organisation in the Supply Chain has its own operations and operations management

Basics of Transportation

Transportation is one of the most relevant processes linked to External Logistics and SCM. Transportation decisions are typically about modes, formats and pricing and they contribute to **make-or-buy** decisions as we will see

External Logistics -Transportation modes

- ✓ Road transport
- ✓ Rail
- ✓ Water
- ✓ Air
- ✓ Pipeline
- ✓ Multimodal



Road transport

Strengths

- ✓ **Flexibility** to pick up and deliver where and when needed
- ✓ Often the best balance between cost/flexibility and delivery speed
- ✓ Quite reliable
- ✓ Can deliver **straight to the customer (JIT)**
- ✓ Good availability in terms of time

Weaknesses

- ✓ Only for '**local**' transports
- ✓ Not the cheapest
- ✓ Not the greenest



Water (Vessels)

Strengths

- ✓ Highly cost effective for large and high weight items
- ✓ Highly effective for very long distances



Weaknesses

- ✓ Very slow
- ✓ Works best for many items (cargo containers)
- ✓ Limited locations (harbours)
- ✓ Needs a multimodal system
- ✓ Relatively poor delivery reliability
- ✓ Often limited operating hours at docks

Strengths

- ✓ Quickest delivery over longer distances
- ✓ Can be very flexible when linked to road transport

Weaknesses

- ✓ Often the most expensive
- ✓ Works best for low weight and few items
- ✓ Not for all kinds of items



Rail

Strengths

- ✓ Highly cost effective for large and many items
- ✓ Can be most effective when linked into a multimodal system
- ✓ Environmentally friendly
- ✓ Better delivery reliability/speed than water and lorries

Weaknesses

- ✓ Limited locations (worse than road transportation)
- ✓ Only for continental transportation



Multimodal system...a combination of different transport systems

What really happens to industries...



Shipping from China

Loading into the railcar
(interport)

Transportation to the plant by lorry

Transportation costs can affect the make-or-buy decision process

Supply chain - Vertical integration

- ✓ **Vertical integration** – It is a measure of how much of the supply chain is owned by the final producer
 - **Backward integration** – When the producer owns and runs the operations of raw materials and semi-finished products
 - **Forward integration** – When the producer owns and runs the operations of the channels of distribution

- ✓ Vertical integration is about **insourcing** (**outsourcing** is the opposite) products or services

Vertical integration – Make-or-Buy analysis

- ✓ **Make-or-Buy analysis** compares cost of internal operations vs cost of purchasing the product or service



Make-or-Buy – Case study

ACME Ltd has decided to launch a new glue in to the market. They have forecasted for 20,000 kilos per year. As a first decision they want to analyse whether they should make the glue on-site or buy it from an external supplier. They have calculated the following:

- If they buy from the supplier they will need a logistics company. The lorry costs 1 Euro per each shipped kilogramme
- If they buy from the supplier they will need a quality inspector who, irrespective of the quantity, will cost 10,000 Euros per year
- If they make the glue on-site they will have to buy raw material and it costs 0.1 Euros per kg
- If they make the glue on-site they will have to buy a new dedicated blender. It costs 100,000 euros and it will be amortised in 4 years
- If they make the glue on-site they will have to spend 0.1 Euros of electricity per Kg
- If they make the glue on-site they will have to spend 0.2 Euros per Kg in production logistics activities and inspections

Should ACME make or buy the glue?

Make-or-Buy – Exercise, solution

$$C_{\text{TBuy}} = 10000 + 20000 \times 1 = 30000 \text{ €}$$

$$C_{\text{TMake}} = 25000 + 20000 \times 0.1 + 20000 \times 0.1 + 20000 \times 0.2 = 33000 \text{ €}$$

It seems that (for the first year) it is more affordable to buy the glue from the supplier...it would be $30000/20000 = 1.5$ Euros per kg compared to $33000/20000 = 1.65$

However, it is not just a matter of money....

Make-or-Buy analysis – the Overall cost of the supplier

In the past, Make-or-buy analysis was just a matter of product cost

But we have to take into serious consideration costs such as:

- **Cost Of Poor Quality (COPQ)**
- Cost Of Poor Service (delays, disruptions, poor packaging, etc.)

The reasonable diligence of the supplier can surely affect the make-or-buy decision as well

Moreover we have to deal with some strategic issues



Supplier evaluation and selection – The overall cost

Supplier evaluation and selection as well as make-or-buy analysis are related to the **Overall cost of the supplier** rather than the pure product cost. Example:

According to the forecast, last year ACME bought 20,000 kilos of glue from the supplier having paid for them 30,000 Euros. However ACME had to reject a large quantity of supplied products due to poor quality. This stopped ACME production for one month with the result of many customers' claims and the loss of an order worth 10,000 Euros.

We can say that ACME paid for the glue at least:

$(30,000 + 10,000)/20,000 = 2 \text{ € per kg ...not } 1.5 \text{ € per Kg as we believed !!}$

Make-or-Buy – Strategic decisions

Before **insourcing** or **outsourcing** we have to take into serious consideration also some strategic issues:

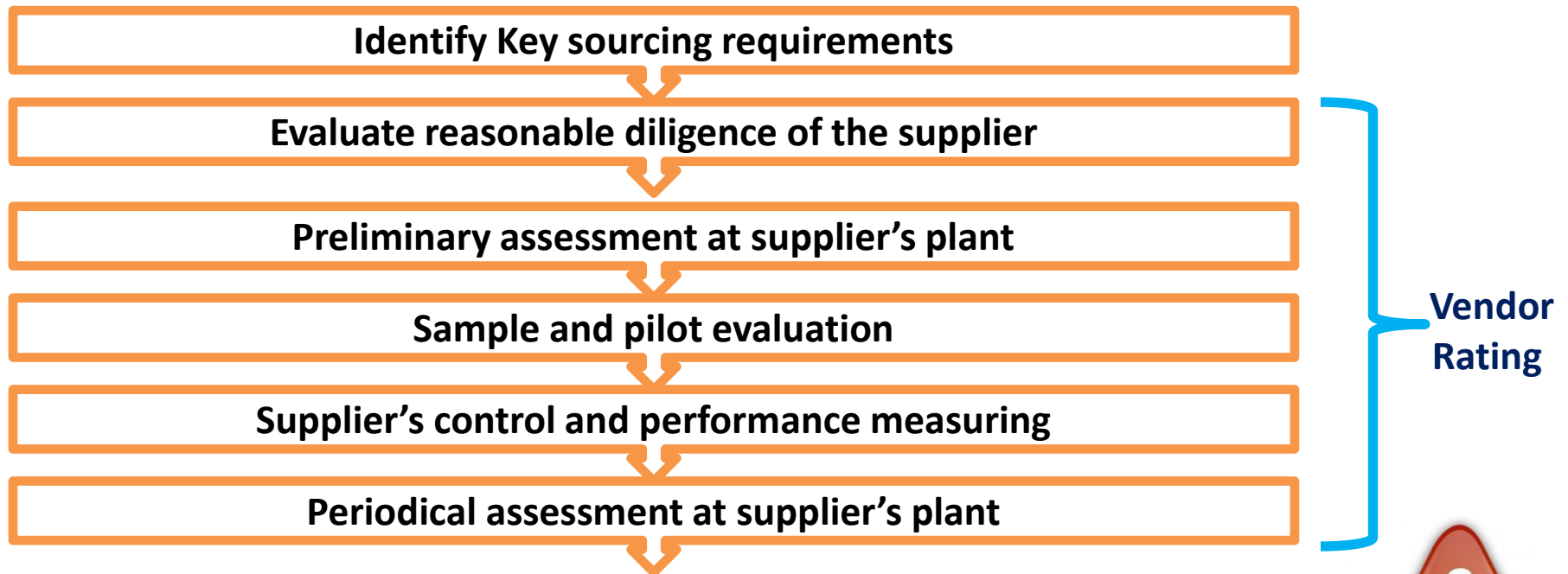
- ✓ Is the product technology critical to company's competition?
- ✓ Is the product of core competency?
- ✓ Is it something the company must do to survive?

What about if you are the only player in the market, your competitors are not able to make a similar product yet and you find a good and cheaper outsourcer in the Far-East....think about it

Supplier evaluation and selection

The main goal is to reduce sourcing risks and maximize value to the buyer, creating at the same time a long-term relationship with the supplier

Typical supplier evaluation and selection flow



Supplier evaluation and selection

Identify Key sourcing requirements. They come from the Product/Process Design process (e.g. QFD) and from marketing strategies

- ✓ Price
- ✓ CTQs of the product/service/packaging
- ✓ Expected delivery performance
- ✓ Strategic issues of the supply (e.g. classified items, patents)

Supplier evaluation and selection

But first of all...You have to evaluate the reasonable diligence of the supplier

Also known as ‘**Due Diligence**’. It is a preliminary stage where we want to evaluate the capacity of **Business Continuity** of the supplier. In particular, in case of serious incidents or disasters that might interrupt a supplier’s operations:

- ✓ The supplier shall be able to continue to operate or
- ✓ must be able to recover critical processes to an operational state within a reasonably short period

You have to identify supplier’s **Critical Business Processes** within operations and you assess them through an **audit** and **Risk Analysis** methodologies like the **FMEA**



Supplier evaluation and selection

Supplier's Business Continuity elements (Gittleman, 2013)

- ✓ **Resilience (capacity of recovering)**: critical business processes and their infrastructure has to be **designed** and developed in such a way that they are **unaffected by disruptions**, for example through the use of redundancy and abound capacity
- ✓ **Recovery**: **procedures** are **put in place** to recover or restore critical business processes that fail for some reason
- ✓ **Contingency**: generic capability to manage effectively with **whatever major incidents and disasters occur**, including those that were not foreseen (e.g. **acts of god**). **Contingency plans** constitute a last-resort response if resilience and recovery processes should prove inadequate in practice

Supplier evaluation and selection

Supplier's Business Continuity elements, examples

- ✓ **Resilience (capacity of recovering)**: we have designed a process with a critical machine. If the machine stops working we will not be able to make any product. Therefore we have introduced a parallel similar machine as an automatic back-up
- ✓ **Recovery**: we have put in place some written procedures for operators. They have to follow these instructions in case of the critical machine would stop working. For example they have to switch-on another machine and transport all the products to the new machine
- ✓ **Contingency**: in case of acts of god (e.g. a disastrous flood) as a contingency plan we will move very quickly the products to another plant

Supplier evaluation and selection

Supplier's Business Continuity elements. How supplier's processes can fail and interrupt business relationship? Examples:

- ✓ Relevant failures to machines and equipment
- ✓ Financial problems
- ✓ ICT (Information and Communication Technology) System problems
- ✓ Environmental incidents
- ✓ Health and Safety incidents
- ✓ Ethical scandals
- ✓ Penalties and sanctions
- ✓ Strikes
- ✓ Turmoils, Riots, Terrorism, Pandemic
- ✓ Acts of God (accident or event resulting from natural causes without human intervention)



Supplier evaluation and selection

Preliminary assessment (audit) at supplier's plant. Reasonable supplier's diligence as well as other relevant processes can be assessed or audited at supplier's plant, for instance:

- ✓ Evaluation of production capacity (Machines, equipment, tools, etc.)
- ✓ Balance sheets
- ✓ Quality Management System (e.g ISO 9001 QMS)
- ✓ Quality control procedures and measuring instruments
- ✓ Logistical processes and Warehouse management
- ✓ Environmental, Health & Safety Management System (e.g. ISO 14001)
- ✓ Etc.

Usually the preliminary assessment leads to classify the supplier in a Vendor Rating system (i.e. Class A supplier, 100% classified supplier, Gold supplier, etc.)

Supplier business continuity – a case study

ACME has identified a potential outsourcer in Turkey. They can deliver high quality products at half the price of making them. They also have a good reputation in terms of punctuality and logistics management. In two weeks they can produce and deliver the products by lorry. However, during a first audit at their premises, ACME has collected some data and information about this Turkish supplier not so good and **ACME is now supposed to evaluate them through FMEA issuing some improvement plans.**

They manufacture products using **one big hot press**. This represents the production core and this only one press is particularly old. In case of press stoppage it could cause up to 1 Million euro damage to ACME. In Turkey they are the only company with such a particular hot press. There is a possible other supplier in Czech Republic but it costs twice as much as the Turkish one. Another in China but they deliver products in about two months and you cannot afford such a delay

The Turkish supplier has a **terrible situation in terms of workers' health and safety**. They had many work related injuries and two mortal incidents in the last five years. Turkey is adopting European laws and the Government is going to clamp down on it with strong fines

The Turkish company has a **central server** where they save and store all technical data and information. They also have a good internet connection. However they do not have any backup system. In case of data loss it can cost to ACME up to 10,000 euros and some delays

In the last year their **balance sheets were not so good**. They had a tolerable loss of 30,000 euros.

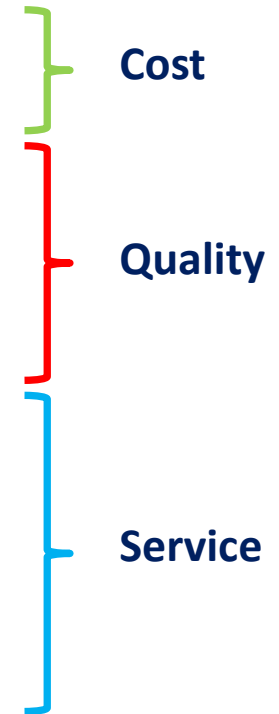
They are located in Eastern Turkey. In 2010 and 2011 they were hit by strong **earthquakes**. Fortunately with small damages to the plant. However, the manufacturing plant is still the same

Critical Business Process	Potential risk	Effects	Risk causes	O	S	RPN	Resilience-Recovery and Contingency plan
Hot press	Relevant Machine failure	Total and prolonged production arrest	Lack of maintenance	3	8	24	Introducing preventive maintenance (TPM) Go to Czech supplier
Health & Safety system	Work related injuries	Total and prolonged production arrest Ethical scandals	Health and Safety management system not applied	3	10	30	Implementation of a Health and Safety management system in compliance with EU standards and legislation Go to Czech supplier
Technical Data Backup	Data loss	Delays	Lack of backup system	3	4	12	Implementation of an automatic backup system Cloud file sharing
Accounting	Supplier gets in debt	Temporary production block	Lack of bailout funds	3	6	18	Increasing financial reserves Direct credit to the supplier
Facility maintenance	Building collapse	Total and prolonged production arrest	Earthquake Lack of refurbishment	1 2	10 10	10 20	Refurbishment with earthquake resistant structures Go to Czech supplier

Supplier evaluation and selection

Supplier's control and measuring. Over time supplier is being controlled and monitored through **Key Performance Indicators** such as:

- ✓ Product Costs maintained or reduced
- ✓ Payment terms
- ✓ Product quality (scraps and non-conformance parts)
- ✓ Percentage of incoming rejects (delivery accuracy)
- ✓ Warranty claims
- ✓ On time delivery performance against agreed delivery time
- ✓ Service Quality (against agreed Service Level)
- ✓ Call-out time (service visit)
- ✓ Customer service response time
- ✓ Etc.



Supplier evaluation and selection – a case study

ACMA manufactures electric engines. For its suppliers of electric rotors has put in place a Vendor Rating system based on the following criteria:

- ✓ After a positive pilot test the supplier earns 60 points out of 100
- ✓ The supplier gets 5 more points each 1% discount on the price target
- ✓ The supplier loses 1 point each 0.1% of turnover in terms of COPQ
- ✓ The supplier loses 1 point each 5 days of accumulated delivery delay
- ✓ The supplier gets 10 points every year in case of deliveries with no problem

First of all, the company buys products from the suppliers with the highest score

Suppliers which have totalised less than 50 are put on a hold state and they receive an assessment

SCM – Strategic issues

In the long-term it is better to create a partnership with the supplier (**comakership**) rather than just continue evaluating and measuring the supplier. Critical factors in successful long-term relationship are:

- ✓ Sharing a common vision
- ✓ Sharing short/long term plans (especially production plans)
- ✓ Sharing data/information (same KPIs, same software, etc.)
- ✓ Driven by customer/end-user needs
- ✓ Sharing risks and opportunities (example, common investments in new products/services and new markets)

SCM – Strategic issues

Benefits of Partnering:

- ✓ Using supplier expertise to develop and share cost improvements and eliminate costly processes
- ✓ **Early Supplier Involvement** in the design process (e.g. FMEA, DFX) (**codesign**)
- ✓ Shorten **Time To Market**
- ✓ Shorten overall **lead time** (e.g. implementing Lean Manufacturing in both organisations)

SCM – Strategic issues

Just one supplier-partner for item?

Strengths

- ✓ Supplier more responsive
- ✓ Supplier at its maximum performances
- ✓ Deliveries can be scheduled more easily
- ✓ Supplier supports lean and Just-In-Time
- ✓ Orders can be very small
- ✓ Supplier invests in new machines, dies, tools, etc.
- ✓ Supplier invests in new markets
- ✓ Supplier involved in design process

Weaknesses

- ✓ Competition among suppliers can lead to aggressive discount
- ✓ One supplier increases business risks
- ✓ Supplier's dependence
- ✓ A single supplier could not be able to handle sudden order peaks



EXERCISES FROM PREVIOUS WRITTEN EXAMS

For the overall cost of a supplier you can take into account:

1. cost of poor quality
2. cost related to products delayed
3. cost related to poor packaging
4. cost related to marketing initiatives towards new customers