Lernkartei «OPS»

Operations Management

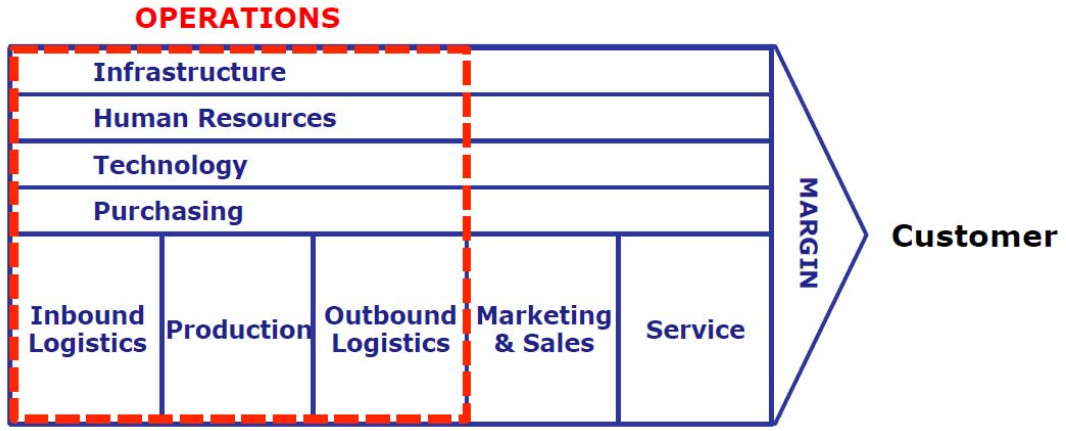
HSLU – T&A, Autumn Term 2013

OPS Week 1:

Checkpoint

Which Functions are part of Operations?

- Purchasing
- Inbound Logistics
- Outbound Logistics
- Production
- Quality (often included in Operations



Which different types of goods flow in the Supply Chain?

- Raw materials
- Components
- Semi-finished goods
- Finished goods
- By-products
- Consumables
- Trading goods
- Services
- Information

What else flows in the Supply Chain?

If we look closer, in a modern Supply Chain more than finished Goods, Money and Information is exchanged:

- Cash
- Information
- Ideas & Innovation
- Risks

Which are the 6 «rights» in of Logistics?

- Making sure that the customers are delivered with:
  - The right **GOODS**
  - In the right **QUANTITY**
  - At the right **TIME**
  - At the right **PLACE**
  - In the right **CONDITION**
  - At the right **COST**

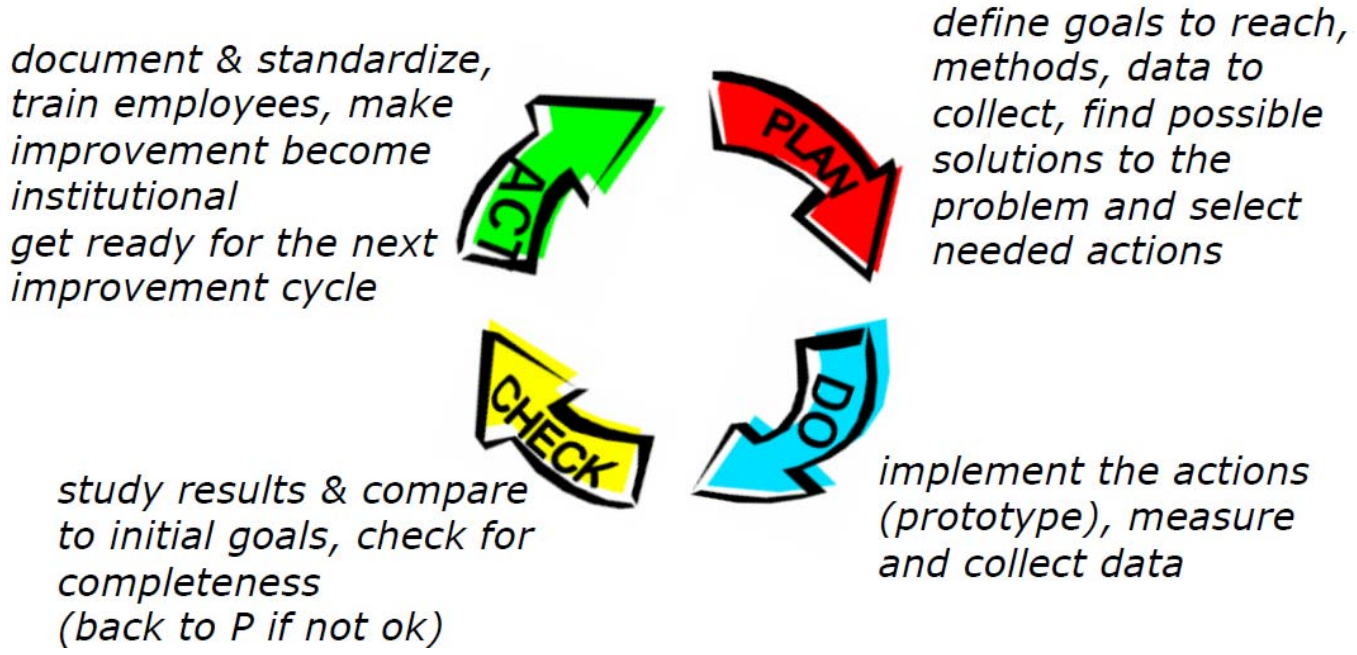
What are the basic elements in a «process view» of business?

- Every activity can be viewed in a sequence of related steps having one or more inputs and one or more outputs.
- Every activity has at least one supplier enabling it and a customer profiting from it.

What is the meaning of PDCA?

- «Deming circle» - Continuous improvement
- Plan – Do – Check – Act

Shewart's idea applied successfully by Deming
for problem solving and improvement



What does «conformity» mean?

- Conformity is the act of matching attitudes, beliefs, and behaviors to group norms.
- http://en.wikipedia.org/wiki/Conformity
- The assurance to the customer, concerning: process for contiual improvement of the system

Who defines the needed level of Quality in a product?

- Quality starts at the Top
  → result of the chain
- If you want it, you need it throughout the steps

ISO 9000 started the Quality Revolution in the Western World (Y/N)?

???

- → Deming?

Is ISO about conformity or about excellence?

- ISO is about CONFORMITY.
- Conformity assessment is the process used to show that a product, service or system meets specified requirements. These requirements are likely to be contained in an ISO standard.
- Showing that a product, service or system meets certain requirements has a number of benefits:
  - It provides consumers with added confidence.
  - It gives the company a competitive edge.
  - It helps regulators ensure that health, safety or environmental conditions are met.

http://www.iso.org/iso/home/about/conformity-assessment.htm

Why were the Americans so confident of their manufacturing superiority?

???

- If Japan can, why can't we?
- Deming & his ideas become well known world wide & his lectures at MIT

Which were the two «evils» of Deming?

- Variations

- Waste

Compare ISO9004 and EFQM

ISO9004 App. B	EFQM
Customer focus	Adding Value for Customers
Leadership	Leading with Vision, Inspiration and Integrity
Involvement of people	Succeeding through people
Process approach	Managing by processes
System approach to management	~Achieving Balanced Results
Continual improvement	
Mutually beneficial supplier relationships	Building partnerships
	Nurturing Creativity & Innovation
	Take Responsibility for a Sustainable Future
Factual approach to decision making	

OPS Week 2:

Checkpoint

What is the purpose of an ABC analysis?

- Separate things
- Focus on the right things («A») and manage efficient

The ABC analysis is a refinement of the Pareto view: instead of two classes there are three

A) 10÷20% of items cover 70÷80% of the analysed phenomenon

B) 20÷30% of items cover the following 20÷15%

C) 70÷50% of items cover the last 10÷5%

How to manage differently "A" parts/ Clients/ Suppliers from "C" ones? (1/2)

"A" parts

- - Prices reviewed with suppliers at each new order
- - Picking strictly controlled in the warehouse
- - Inventory levels optimised to reduce investment
- - Frequent deliveries by supplier(s)
- - Regular physical inventory counts
- - Supplier market surveys and benchmarks

"C" Parts

- - Purchased in bulk quantities, little price negotiation
- - Picked freely (no picking documents in the system)
- - Seldom or no physical counts
- - Replenishment task can easily be given to supplier

How to manage differently "A" parts/ Clients/ Suppliers from "C" ones? (2/2)

"A" Clients

- Dedicated Key Account Managers
- Continuous contact and visits (by Sales, R&D and Production dep.ts)
- Special focus of R&D in innovative projects for A Clients
- Go the extra mile for A Clients

"A" Suppliers

- Intensive contract negotiations with a Partnership approach
- On site visits and audits
- R&D Continuous Improvement projects together
- Key Suppliers' circle and events

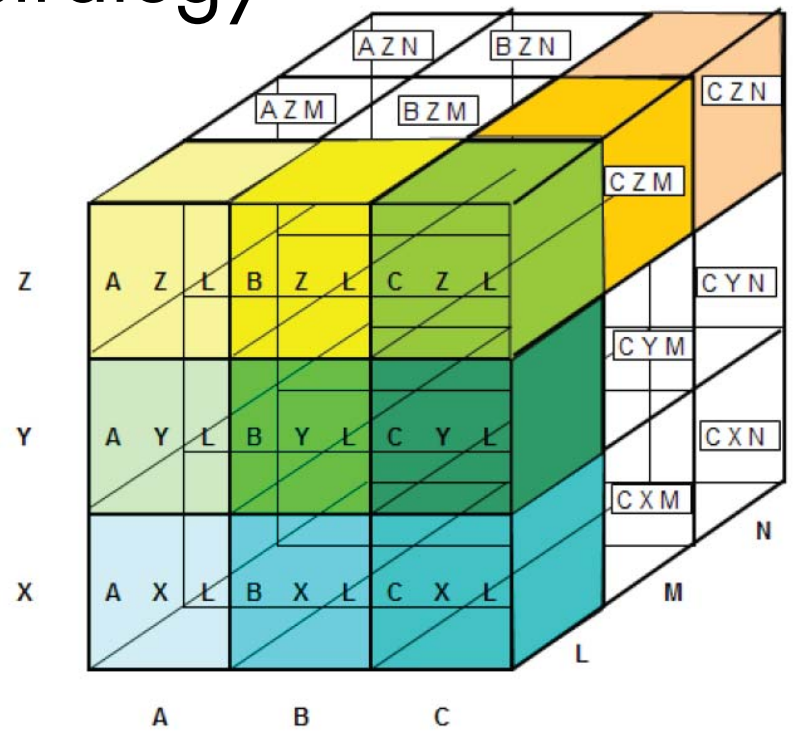
What is an Article Cube?

- ABC in 3 dimensions
- You then have different blocks and for each block you can apply a strategy

Current	
COGS last 12 months	
ABC (ACP)	
Top 10%	A
Mid 20%	B
Last 70%	C

New	
Picks last 12 months	
XYZ (oder lines)	
> 15 pics	X
6 - 15 pics	Y
0 - 5 pics	Z

New	
Number of different customers	
LMN (customer no)	
> 4 customer	L
2 - 4 customer	M
0 - 1 customer	N



Mention the key Market challenges for manufacturing companies

- Incessant Cost pressure
- Innovation and Price pressure
- Reducing Vertical Integration
- Customer perceptions hurt Profitability
- Crises can be destructive (2008-10)
- There is no guarantee for continued success

Conclusions

- No company nowadays can feel safe, not even the “best in class” (Toyota)
- Those who cannot innovate their products and their processes are
- doomed to failure (see the big three)
- The need for continuous improvement is there more than ever

What is a Quality Policy?

Does it tell if a company is excellent?

- In quality management a quality policy is a **document jointly developed by management and quality experts to express the quality objectives** of the organization, the acceptable level of quality and the duties of specific departments to ensure quality.

- It's only what they say, they also have to do it. Excellence is not found in a certificate nor in the Stock exchange results.
  - Excellent companies do show "strong" organisational culture, whatever their industry sector: employees are "convinced"
  - Few themes are recurrent: "Client is King", Quality and Service are the key to success

What tells that a company is on the path to excellence?

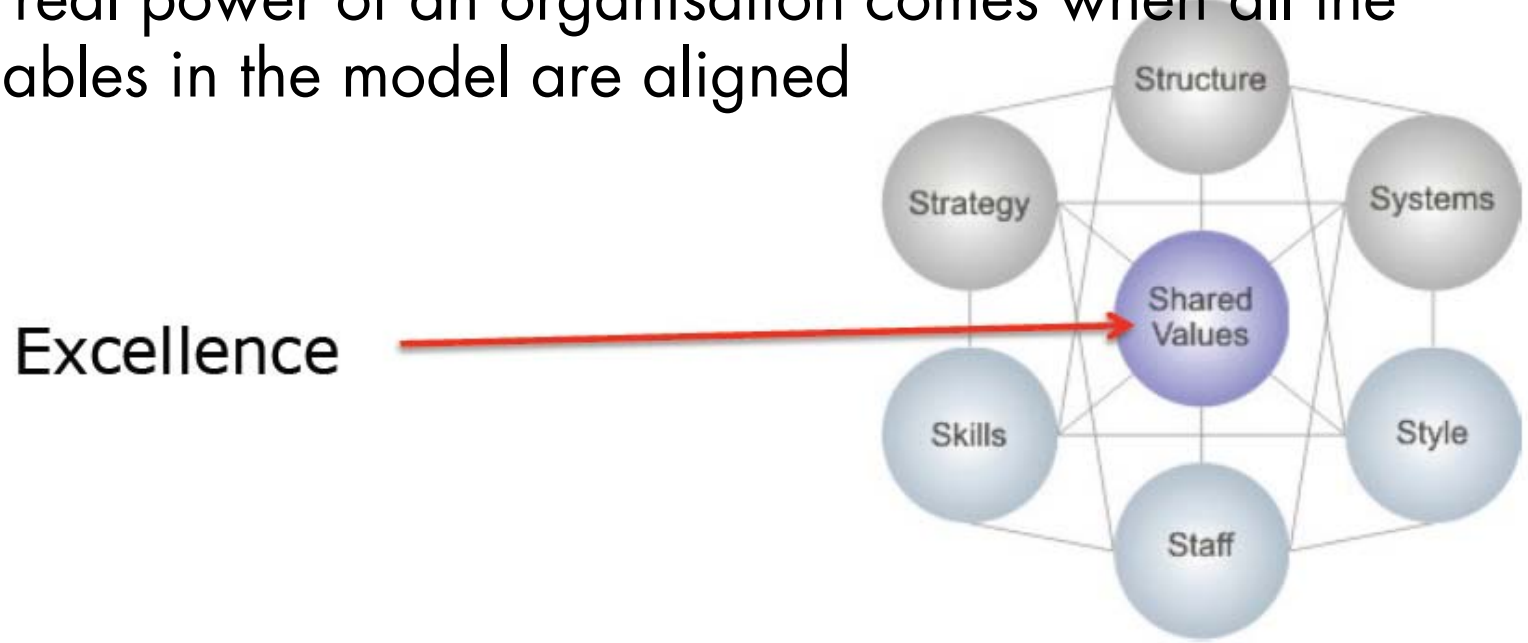
- The search for excellence never ends.
- To strive for perfection every day. Being the best you can be. Not just fulfilling, but even anticipating the needs of stakeholders/customer/employees

What needs to be the "right one" for a Company to be excellent in the long run?

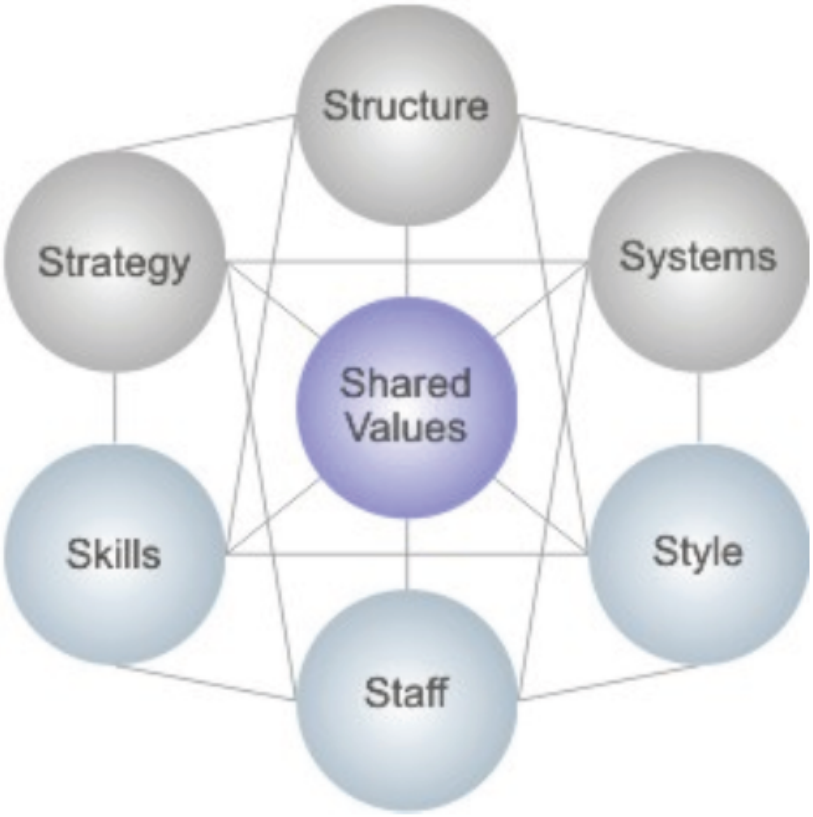
- Company culture

What have Vision and Strategy to do with Excellence?

- Vision and Strategy are part of the 7S Model → Change: The Elements to work upon (7S Model)
- The 7S framework forces us to concentrate on interactions and fit of several facets/ elements of an organisation
- The real power of an organisation comes when all the variables in the model are aligned



Change: The Elements to work upon (7S Model)



Hard Factors

Strategy: the plan on how to build competitive advantage and grow
Structure: the physical and logical organization and reporting lines
Systems: the processes followed to get the daily job done

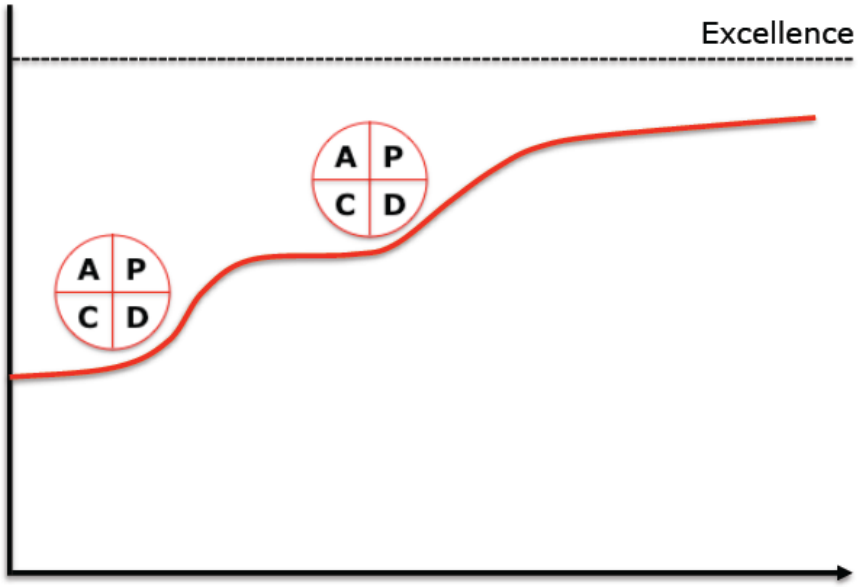
Soft Factors

Shared Values: the core values of the company (vision, culture, work ethics)
Style: the leadership style
Staff: the human capital
Skills: the competencies

Why applying repeatedly the PDCA cycle?

➔ The improvement path never ends

- After one improvement cycle, another follows: be persistent
- Standardization of results is mandatory (stabilize) to avoid falling back to the previous state



Where in PDCA is the stabilisation phase, making changes a part of the routine work?

Part of the **Act**:

- document & **standardize**, train employees, **make improvement become institutional** – get ready for the next improvement cycle

Which Tool helps setting Action plans coherent with the company strategy?

- "Policy management" or "Hoshin Kanri" is a method to define and document the Annual Plan of a company

- The idea originated at Bridgestone in Japan in the early '60s, when they recognised they weakness in planning and execution

  - "Hoshin" means "objectives", "direction", but also "compass"
  - "Kanri" means "control" or "management"
  - **→"management of the objectives/ of the direction"**

- The strategy is broken down into initiatives and each is given a responsible and precise targets.

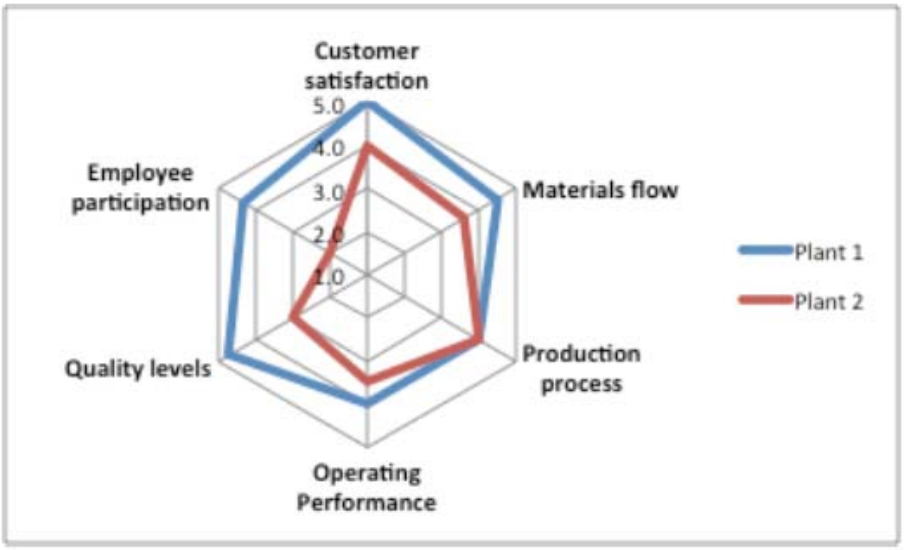
What use has a self-assessment? Is it precise enough as analysis tool?

➔ Know yourself before improving

- Gathers quickly and simply useful information
- Focuses mostly on qualitative elements (areas where quantitative data are normally missing)
- The more precise are the questions and the more guided the waypeople can answer, the better the result
- **Provides an initial overview and a visual status of a unit**
- Allows for comparison with other units or for the same unit over time
- Makes evident areas of distinctive performance or weakness

What charts are best to show self-assessment results?

- Bars
- Spider



Mention the key Kaizen conduct rules

1. It is the task of everybody to improve
2. Problems are an opportunity for improvement
3. All ideas are equally valuable (until proven different)
4. All participants are equally valuable
5. Base action on facts (collect and analyse data first)
6. Managers must motivate and lead in first person the improvement process
7. Teamwork and employee motivation are powerful tools
8. Control by Walking Around (at “gemba” the place where things happen)
9. Do not think too much… do it!

OPS Week 3:

Checkpoint

Why outsource in and/or outbound Logistics?

???

- Outbound: if it is cheaper to make outside the company
- Inbound: Like bossard;)

Which transportation means is more relevant globally?

- road

What are the advantages & disadvantages of the 4 transportation means?

- **Air**
  - PRO: Speed, Dense network of airports, Many carriers
  - CON: Most expensive, Highest eco-impact, Space limitations for load, Not for volume production
- **Sea**
  - PRO: Extremely low cost, Must fill containers' volume
  - CON: Slow, Special packaging (humidity, temperature), Dependency from few harbours
- **Rail**
  - PRO: Most eco-friendly, Almost no weight limits
  - CON: Loading/ unloading at cargo railway stations is a bottleneck, Railroad schedules and time of operation is a limit, Road competition: decline in volumes and price increases (EU), Lack of investment in intermodal (Rail+Truck) infrastructure limits growth
- **Road**
  - PRO: capillary network, more flexible (up to 24/7), requires least investments, big lobbies fight for it
  - CON:- Size of truck (depends on land), Road tolls tend to increase, Road accidents and traffic congestion, Pollution

How to store bulk items? And small items? How to protect them?

- **Bulk items**
  - On the Floor (in bulk status): for big or heavy solids that cannot be damaged (picking from the floor is not ideal)
    e.g. Coils, Rolls, Pipes, Bags, Bales
- **Small items**
  - Drawers and Boxes: for very small parts (e.g. electronic components, fasteners…)
  - Supermarkets: racks with roll conveyors. Parts or boxes are loaded on one side, move by gravity and are picked from the other side (FIFO)
  - Paternoster: particularly suited to store small items and tools and to retrieve them quickly

- Can be **protected** by specific containers, foldable containers or crates.

What are the 4 categories of Inventory in a Plant?

- **Raw Materials and Components** : all purchased items delivered by suppliers, after incoming controls (quantity and quality)
- **In-process**: parts partially manufactured between machines or work-cells in the shop-floor
- **Semi-finished goods**: manufactured items or modules, that will be used in the assembly to obtain finished goods
- **Finished goods**: end-products stored until picked for shipping to customers

What are Obsoletes?

- Obsolete = out-of-date, outmoded
- **«Obsolete» parts are parts which are still stored in inventory but never "moved"**, representing a hidden cost (unused capital) and a nonhidden cost (occupancy of inventory space that could be used for other currently needed parts).
- This can happen as a result of a wrong material planning.
- An industrial company can easily have in its Parts List thousand of different items; not all of them are sold, manufactured or purchased with the same frequency and volumes
- Periodic control procedures must identify such "obsolete" parts, purging the inventory physically (selling them if possible) and accordingly adjusting the value of inventory in the Balance Sheet (loss)

Who tells you lots of useful information that helps you improve your sales?

- Know your **Customers** business
  - Learn what your Customer does with your product
  - Understand his internal processes and his products
  - Help him perform better, by modifying your products and services
- Know **your Customer's Customers**
  - Look at the whole value chain and understand challenges, discontinuities and market expectations one level down
  - Infer how your company can better serve and influence your own customer, based on the needs of his own customers

➔This may help you discover the unexpressed need for new/ modified products and services

How to measure Customer Satisfaction?

- There are many ways to get this information (surveys, meeting notes, audit reports, complaints…), BUT: one must honestly want to act on his weaknesses
- **A quick Alternative: Net Promoter Score NPS**

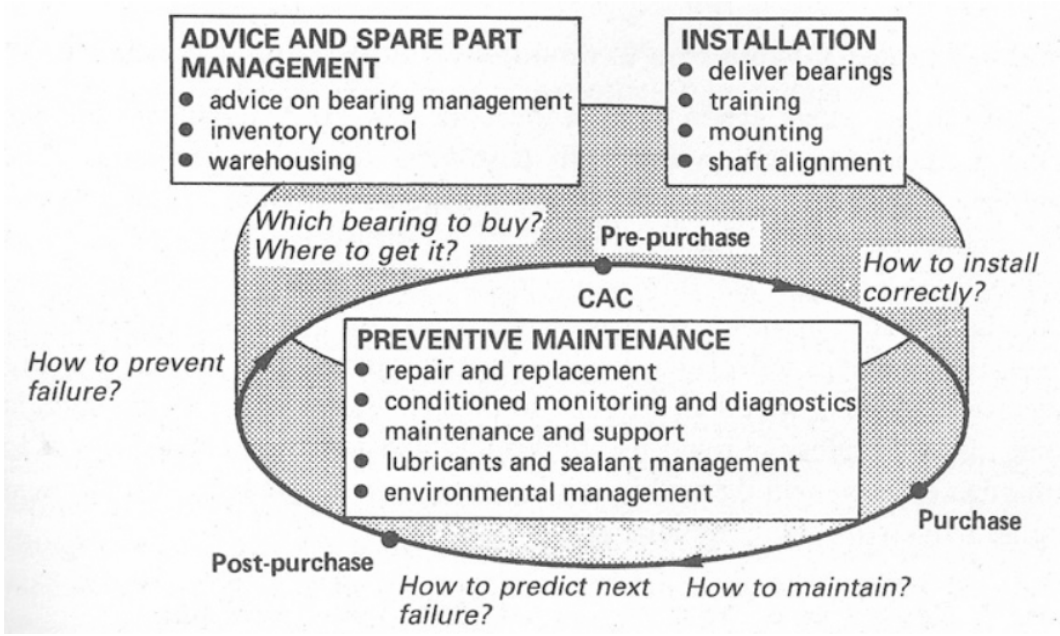
Question: *„How likely is it that you would recommend our company to a friend or colleague, on a 10 point scale?"*

NPS = Promoters% – Detractors% Range: -100 ÷ 100
Good >0, Excellent >50

(usually few additional questions help gather the reasons why)

What is the Customer Activity Cycle?

- **Know and listen to your Customers**: they tell you a lot more than you think – Know your "Customer activity Cycle" to sell more
  - Operations must know too what's happening at the Customer interface and be involved early
  - Processes must be timely adapted/ changed to be able to deliver
  - **Operations and Sales must interact closely**



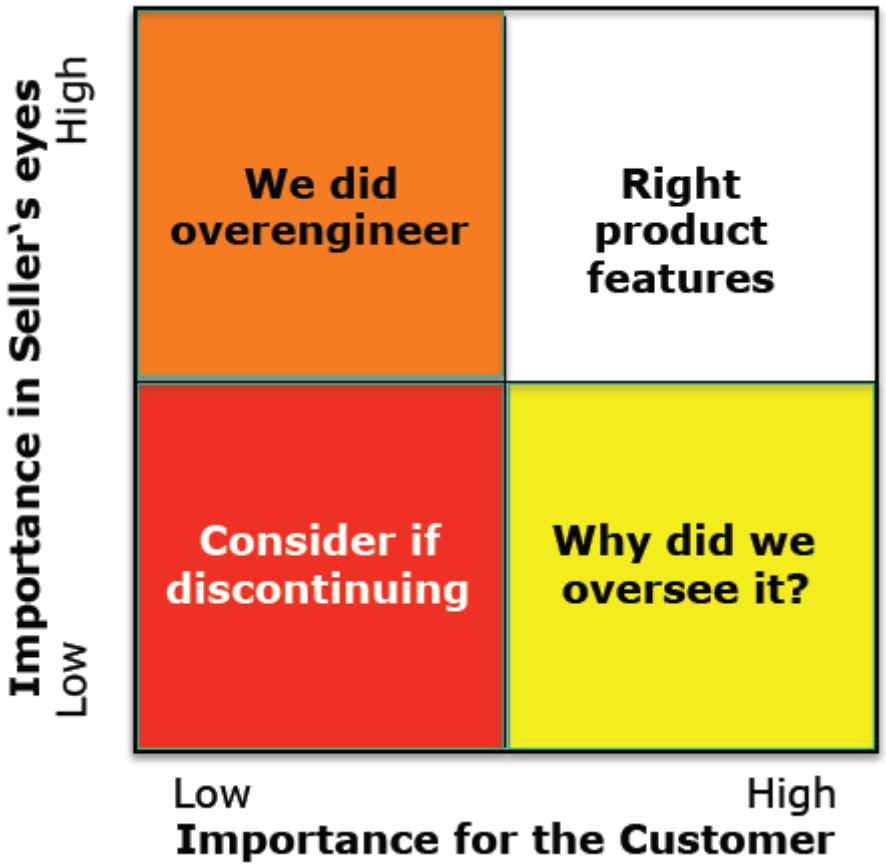
The customer's activity cycle has more to do with users and usage than with formal buying procedures which of course is one part of such a process.

Why reviewing & recording product requirements is stressed by ISO9001? ???

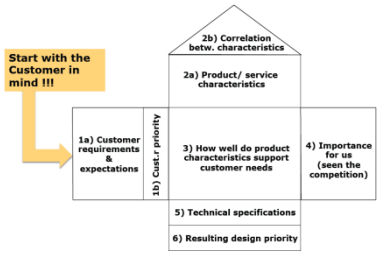
- Everything has to be recorded
- Customer requirements have to be confirmed by the organization before acceptance.

20% of products generate 80% of margin: what to do with the rest 80%?

- Proactively act upon the less profitable products
  - redesign them to reduce costs
  - discontinue them (if possible)



What Tool helps capture Customer needs and bring them into Product and Process specifications?



- Quality Function Deployment = «House of Quality»

- **Deploy Customer Needs into Product Specs**
  1. Get the Customer's Voice (interviews, surveys, users' feedbacks, complaints, warranty cases...)
  2. Analyse competing products and competitors' moves (benchmarking)
  3. Select the most appropriate product/ service characteristics (qualify them with technical measures)
  4. Prioritise these characteristics
  5. Cascade only what really counts from "system" to "component" and finally to "production process"

Which are the main activities performed in Inbound & Outbound Logistics?

- **Inbound Logistics**
  - The activities of calling deliveries from suppliers, receiving, controlling, storing, and distributing internally the incoming goods for use in production
- **Outbound Logistics**
  - The activities of scheduling, picking, packing, labelling and shipping the finished goods ordered by clients, triggering the billing

OPS Week 4:

Checkpoint

What does a Customer measure about the performance of a supplier?

If you won a contract, survived hard price negotiations and produced the goods at the required quality …

Your Customer will monitor:

- Respect of Quality **Q**
- Cost reductions **C** — **traditional Customer KPIs**
- Delivery performance **D**
- After-sales support
- New ideas/ innovation — **additional Customer KPIs**
- …

➢ **You better monitor the same KPIs:**

➢ **to be informed early and initiate corrective actions**

Are customer audits a substitute for ISO9001 audits ?

- No

- Before international norms like ISO 9001 were established, customers performed visits and inspections at their suppliers or used external professionals to do this
- Certifications like ISO 9001 reduced this need
- Still many customers (mostly big groups) perform regular audits in addition to those imposed by certifications
- Procurement personnel, Manufacturing and Technical experts are sent to inspect the suppliers' production sites (from half-day to few days visits) → see how it works

The Safety Stock covers the demand during lead time (Y/N)

- Yes

- Safety stock: uncertainties in customers' demand pattern as well in supply chain lead times require some "protection"

How is the Reorder Point determined?

- Only when inventory is getting too low the Inventory Manager orders goods from the respective (internal or external) suppliers
- This "Reorder Point" depends on the Demand pattern and the Supply Lead Time, example:
  - Daily Demand 15 parts/ day
  - Supply Lead Time avg. 4 days
  - Safety stock 20 parts

  → Reorder point = D_D*LT + SS = 80 pieces (4*15 + 20)

- If Demand and Lead Time in the reorder period are exactly average, there is enough time for the supplier to deliver before the safety stock is used

How much is "Available to promise" to customers?

- Inventory must be enough to cover current and future demand
- Can I really "sell" to customers all what is now "on hand"?
- The availability has to be seen dynamically:

Available to promise=On Hand+Ordered−Reserved−Safety Stock

Why are periodic physical inventory counts necessary?

- **Inventory recorded in the information system may differ from reality**, because of:
  - Deliveries from suppliers with different quantities than it is written on shipping bills/ labels
  - Inaccurate Bill of Materials (more or less parts are picked in reality than the system expects)
  - Inaccurate quantities registered (receiving & picking goods)
  - Items damaged, lost or stolen

- This requires a periodical physical count of inventories and a realignment of the information system to real amounts on stock
- Except for C-parts, at least once per year, but for A-items (high value or critical) more often, according to defined control plans

How is the Safety stock calculated ?

- The std. deviation for non related events is equal to: $\sqrt[2]{\sum_1^n \sigma^2}$
  (demand of a day is not related to that of previous days)

- If only demand changes: so many squared daily deviations are added as many days are in LT:

$$SS = Z * \sqrt{LT * \sigma_D^2}$$

- If also LT changes: the deviation due to LT is added too (expressed in quantity: $D_D * \sigma_{LT}$) :

$$SS = Z * \sqrt{LT * \sigma_D^2 + (D_D * \sigma_{LT})^2}$$

Disadvantages of Automated Guided Vehicles (AGV)

- **Advantages**
  - No labour cost
  - Precise, repetitive

- **Disadvantages**
  - High investment
  - Guiding aerials in the floor
  - Safety precautions
  - Not flexible in emergencies

Risks with fork lifts in a factory

Risk of accidents

Mention different ways and tools for moving goods in a plant

- Manual: by Operators or by Logistics personnel
- Automatic: by Conveyors or by Automated Vehicles

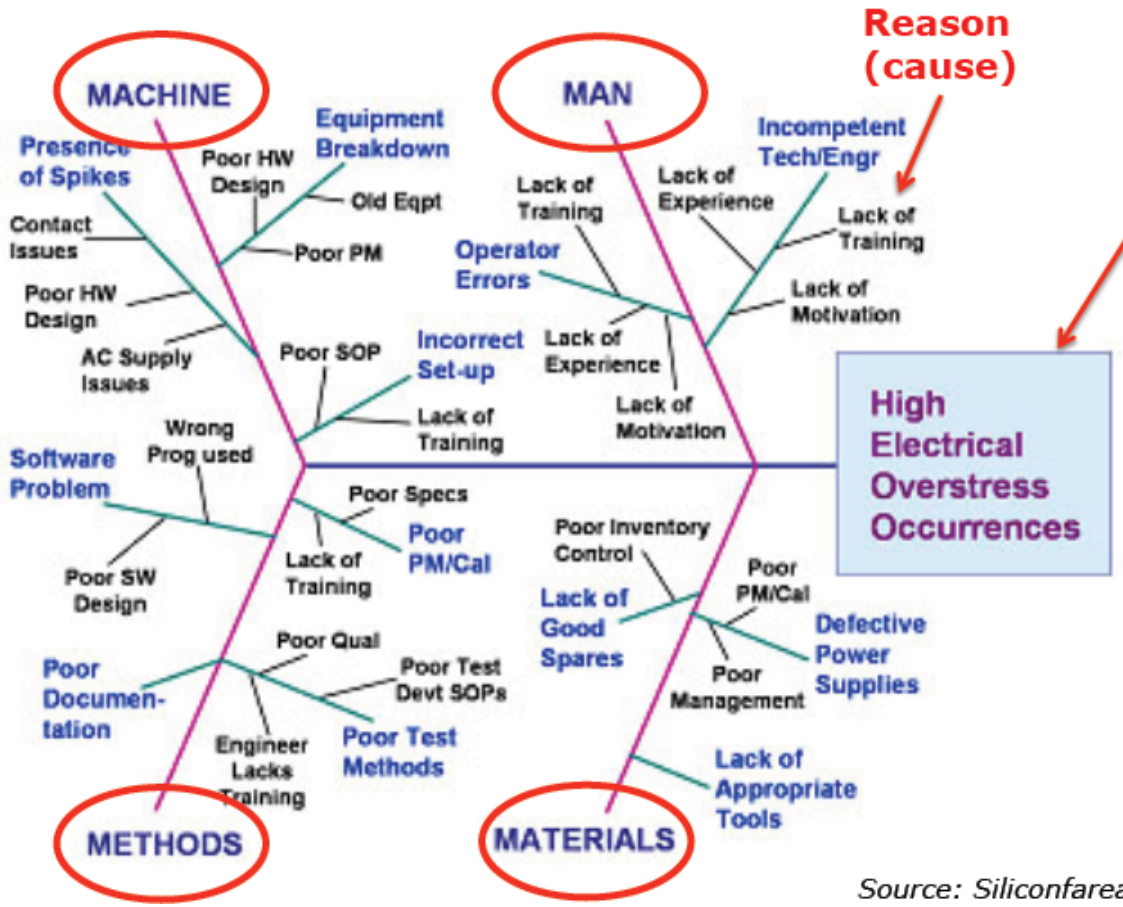
- In batches: e.g. in a Container, Box
- Continuously: e.g. on a Conveyor belt, Line, Pipe

What is the purpose of product traceability?

- to identify where / when a product was produced and with which components coming from which supplier

What is the fishbone diagram? How is it used?

Ishikawa (Cause-Effect) Diagram



Is used for problem-solving
First define accurately the problem, then classify the possible causes in Man, Machine, Methods and Materials
→ Ask 5WH questions to reach the root cause

Source: Siliconfareast.com

OPS Week 5:

Checkpoint

What data are necessary to execute a MRP?

- MRP = Materials Requirement Planning

- Parameters:
  - Existing stock / **Safety Stock**
  - Replenishment time (production or supply **Lead Time**)
  - Order policies (**Lot size)**

What if we cannot satisfy the planned Lead Time?

- Not all parts can be finished → you cannot finish the product and deliver…
- We have to order the next as soon as possible (the week after)
- Even better: we have to get the material daily not weekly.

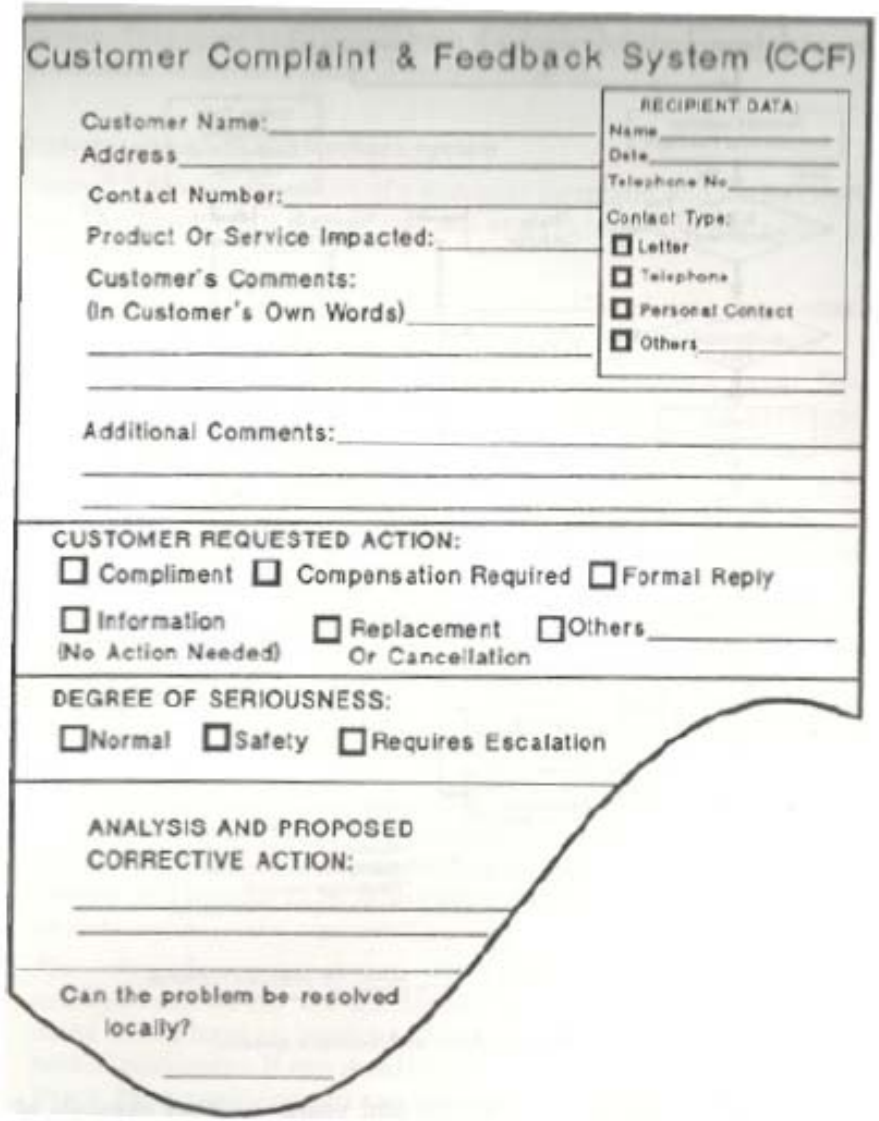
What can go wrong in planning materials needs?

1. Actual deliveries differ from orders (missing or defective parts)
2. Physical stock differs from the inventory data in the ERP
3. Lead times are not kept up-to-date and are longer than the data in the ERP (inefficiencies, machine breakdowns)
4. The BoM or Routings were modified in reality, but not updated in the ERP
5. Alternative Components or Routings are used in production, but not recorded in the ERP
6. Last minute demands are satisfied in the shop-floor (expediting an urgent customer order) therefore altering the availability of components and/or machines

What is the value of a Customer complaint system? Which are its main elements?

- Keep current customers satisfied is less expensive than capturing new customers → Capture the customer's voice / Standardise the data collection

- Use KPIs:
  - Num. of complaints/ month
  - Num. of complaints / product family or product
  - Avg. time to resolve complaints
  - Avg. cost to resolve complaints


Customer Complaint & Feedback System (CCF)

Customer Name:
Address
Contact Number:
Product Or Service Impacted:
Customer's Comments:
(In Customer's Own Words)

RECIPIENT DATA:
Name
Date
Telephone No.
Contact Type:
Letter
Telephone
Personal Contact
Others

Additional Comments:

CUSTOMER REQUESTED ACTION:
Compliment Compensation Required Formal Reply
Information (No Action Needed) Replacement Or Cancellation Others

DEGREE OF SERIOUSNESS:
Normal Safety Requires Escalation

ANALYSIS AND PROPOSED CORRECTIVE ACTION:

Can the problem be resolved locally?

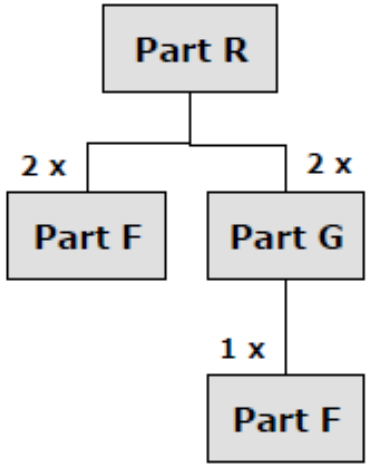
What data are reported on a CAR or 8D report?

- Captures the key information:
  - From problem definition
  - To closing of the case

What is pegging?

To enable a better allocation of inventory, sophisticated MRPs are able to link the orders generated to the original independent demand. The Materials planner can follow better and take decisions if demand changes.

Cust.A Order 121 for 20 R week 3
Cust.B Order 214 for 50 R week 4
↓
Purch. Order 432 for 280 F week 2
of which: 80 for Order 121
200 for Order 214



Why is a Customer complaint system relevant for Operations?

- Use all possible sources of "Customer voice"
- Use a standard form to record data
- Act quickly and give feedback to the affected customer (even if the solution is yet to be found)
- Make issue and solution available in your company globally (to avoid reinventing the wheel elsewhere)
- Periodically review the CCS results
- Use KPIs:

Why knowing the Customer Activity Cycle is valuable?

- Consider your product (and costs) when "in use" at the customer
- Take customer opinion & issues as learning opportunities

Bossard Visit (1/3)

- What is the value Bossard offers to its Customers?
  - High service level
  - No run out of stock

- Do you remember the % of cost due to fastener's price compared to their management cost?
  - 4%

Bossard Visit (2/3)

- How many parts do they manage?
  - 50'000 standard parts
  - 200'000 incl. others

- What is the advantage of their BIM? (Bossard Inventory Mgt)
  - Reduce process costs
  - Reduce stock
  - Improve process safety

Bossard Visit (3/3)

- What does Bossard absolutely need to offer excellent services?
  - State of the art IT solution → Bossard has own system → if system fails, they're dead
- Which 3 important things (valid in all industries) were mentioned?
  - Simplify
  - Standardize
  - Automate
- Potential risks?

OPS Week 6:

Checkpoint

Mention the main processes in R&D

R&D Strategy	Product Concept	Product Design & Testing	New Product Introduction	Product Life Cycle Mgt
Monitor technology Monitor markets Define strategic technology areas Prioritise and focus Align w/ Corporate strategy Plan R&D resources	Use customer inputs Use int.l resources Use ext.l resources Idea generation Idea screening Solution seeking Problem solving Define product use and Requirements Do a Business plan	Product design and development Prototyping Near testing Beta testing (field) Customer interviews Product validation Product specs definition	Industrialisation Initial prod.n runs Quality gates (Product + Process) Market testing Sales force training Market introduction Ramp-up production *All targets met"	Product modifications (upgrades, new versions) Product phase-out

Supporting

Technology Exploitation	R&D Pipeline Mgt	Project Mgt	R&D Data Mgt
Technol. intelligence Cooperations Applied research Phase in/ out of tech Laboratory mgt Tech. library mgt	Multi-prj mgt Priority setting Resources alloc.n Gate reviews R&D Controlling R&D KPIs	Prj definition Prj planning Prj staffing Prj initiation Prj execution Prj reporting Prj closing	Dev.mt BOM Dev.mt Routings Techology data Product Test data Process Test data

Interfaces

- *Sales / Key Account mgrs / Product managers / Customers*
- *Purchasing/ Suppliers*
- *Universities / Research centers / Technical consultants*
- *Competitors*
- *Manufacturing*
- *F&A*

What is the purpose of the Product Development process?

- R&D brings innovation to customers

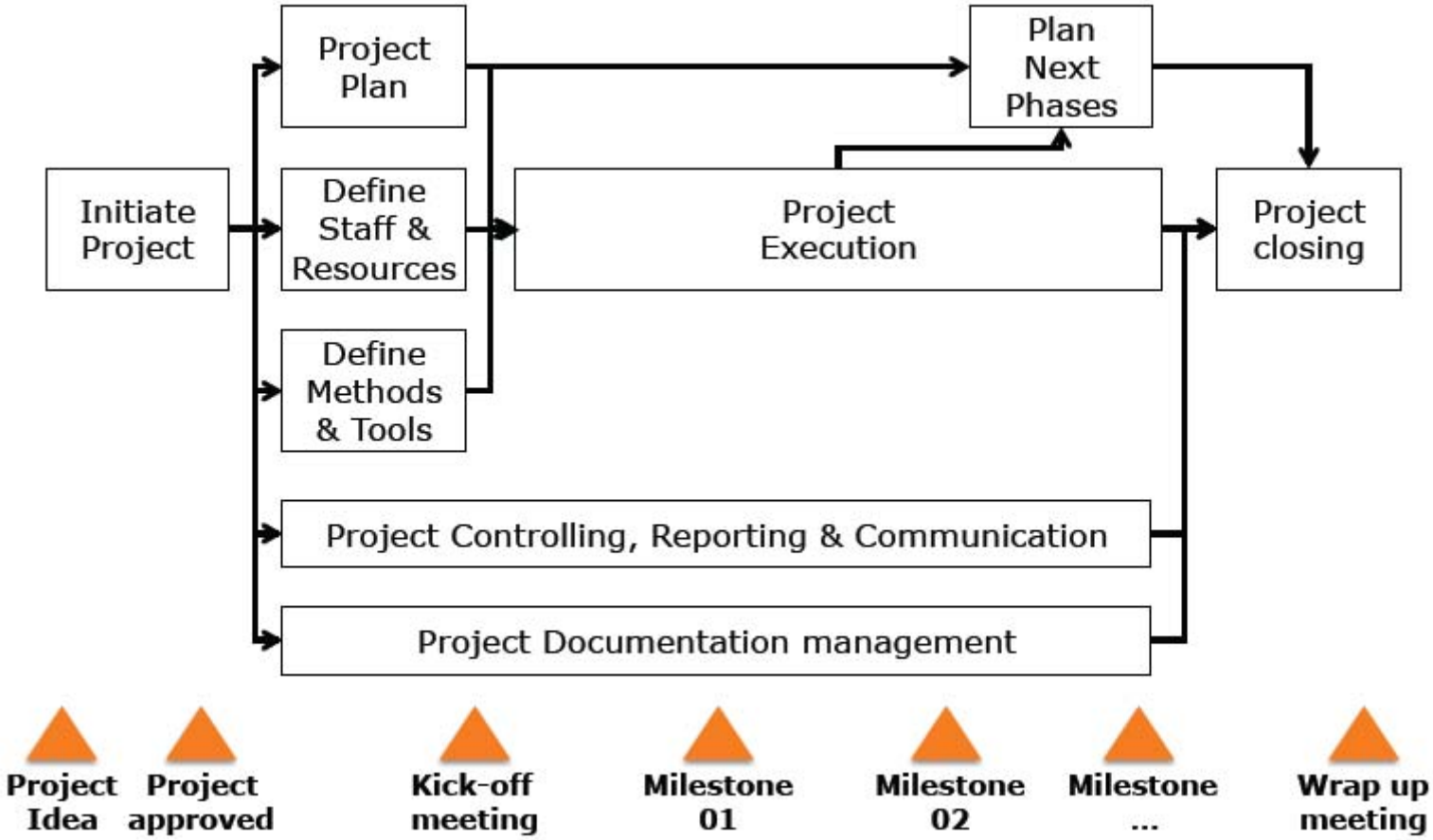
Who should be responsible for Products, from cradle to grave?

- **Product Manager**

Who is responsible for the Development phase of products?

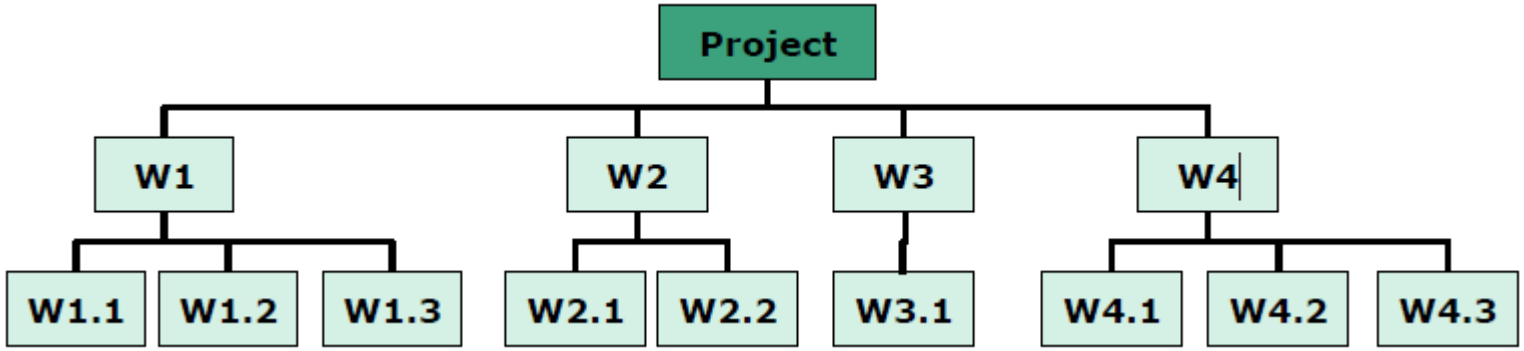
- Project Manager
  (according Landis+Gyr interview)

Mention the activities required to set up and execute a Project



What is a Work Breakdown Structure?

- Any project of reasonable size and importance can be managed, if split into smaller elements
- Each contains comparable amounts of workload, difficulty, time) and are logically complete in themselves, have a clear output, must be assignable to one person for execution
- The result is a tree-like structure or WBS, containing 100% of the activities and outcomes of the project



What is the advantage of Quality/Stage Gates?

???

- Separates project phases at critical points
  - Project results give decision
    - Into next phase, freeze, rework / stop
  - Commit resources only
  - Until the next milestone

What are some typical pitfalls in Project management?

- **in Project Definition/ Planning**
  - The expectations are not clearly expressed, or only partly
  - Unrealistic expectations in the project
  - Planning and resources are too optimistically defined
  - Activities in near future are planned in extreme detail, farther ones are not at all precise
- **in the Project Manager**
  - The person selected is knowledgeable of the domain, but has never managed a project of similar size
  - He has not the required authority, because of age, or position, or personality or because the SC does not give it
- **in the Steering Committee**
  - SC members are not really knowledgeable
  - They are not really adding value (knowledge) to the project
  - They are not really allowed to take critical decisions
  - They do not have enough time to dedicate to the project
- **in Reporting**
  - Reporting does not timely highlight issues
  - Reporting only shows cumulate time/ costs, but no forecasts
  - Reporting is too detailed and SC is lost in details
- **at Project End**
  - No time is spent to document the learnings before the team is disbanded
  - Project participants are immediately allocated to other tasks (often promoted) and the company profits little of their experience in the project domain

Which are the conflicting goals of a project?

Being short of time, for various delays, and exceeding the budgeted costs for inefficiencies and unforeseen difficulties
one reduces the original scope or takes shortcuts which penalise the quality of the outcome

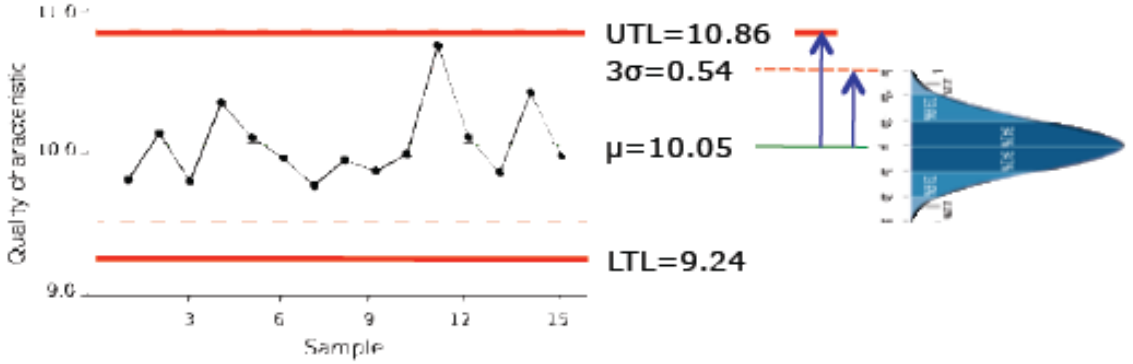
What is the meaning and which the reference values of C_{pk}?

It indicates in one number how well the process remains within its tolerance limits

$$C_{pk} = \min\left[\frac{UTL - \mu}{3\sigma}, \frac{\mu - LTL}{3\sigma}\right]$$

It tells the minimum(1) distance of μ from the tolerance limits, expressed in multiples of 3σ

APQP: requires for existing processes 1.33 (4σ) – for new 1.67 (5σ)



$C_{pk} = 1.5$ (4.5σ)

(1) The average may not be centred between the tolerance limits

Mention criteria one can use to select and prioritize innovation ideas ???

- Right quality
- High yield in production
- Profitability
- Fulfil/anticipate customer needs
- Differentiate from competitor
- Short time to market

Why managing Product development on Platforms?

???

- ???

Mention advantages and disadvantages of FMEA

FMEA = Failure Mode Effect Analysis

Advantages

- Easy schematic, widespread usage (required by Norms, e.g. Automotive ISO/TS 16949)
- Gives a clear sense of priority for action
- Helps eliminate dangerous design aspects
- Helps identify more robust test procedures
- Helps re-discuss "too hard" customer requirements

Disadvantages

- Gives a "false" mathematical confidence in RPN (ratings are mostly qualitative)
- Some risky failures may get underestimated

What is Advanced Product Quality Planning?

???

- To get early attention to quality during development
- It is vital to anticipate all possible issues during design

What is the difference between Creativity and Innovation?

- **Creativity** is to conceive something how nobody did before

- **Innovation** is to create something that was not there before (or existed but was used differently and/or in other areas) and ends being used successfully
  - It is "useable" creativity
  - Standard Definition: Innovation = Invention + Successful market introduction (market exploitation)

Is the business plan done before or after the Prototyping phase?

- Before! (See R&D process)

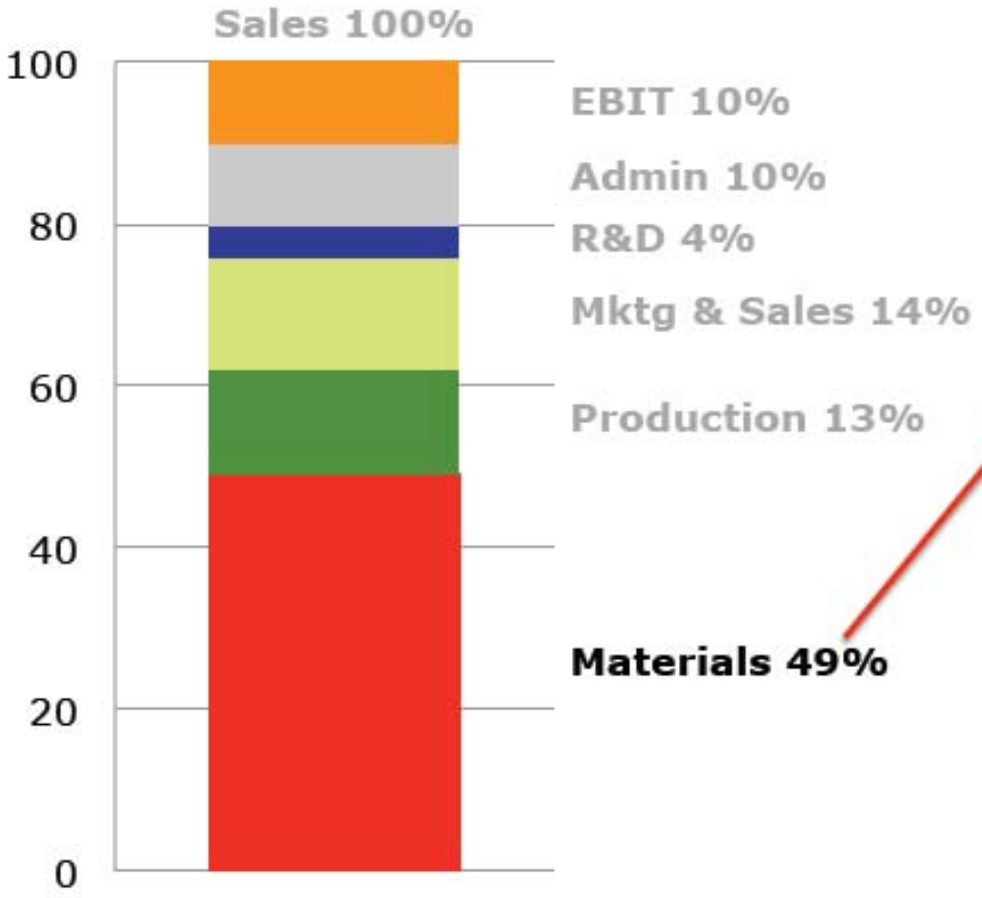
Mention some methods that help in the generation/ discussion of ideas

???

- Post-up method

OPS Week 7:
Checkpoint

What % of costs is on average influenced by Purchasing in an industrial company?



>54% of costs

without purchases of M&S, R&D, Admin.

without the yearly capital expenditure (3-5% of Sales)

NB: Personnel ~30%

Which are the essential elements of the Purchasing process?

According **ISO 9001: 7.4.1 Purchasing process**

- The organization shall ensure that purchased product conforms to specified purchase requirements.
- The type and extent of control applied to the supplier and the purchased product shall be dependent upon the effect of the purchased product on subsequent product realization or the final product.
- The organization shall evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements.
- Criteria for selection, evaluation and re-evaluation shall be established. Records of the results of evaluations and any necessary actions arising from the evaluation shall be maintained.

What is the difference between a Buyer, a Category specialist, a Lead Buyer?

- Buyer
  - **Local** generalist who buys all categories
- Category specialist
  - *Local* category specialists (have knowledge of specific category, e.g. electronic parts) are only in charge for their category
- Lead Buyer
  - all purchases of a given category coordinated from one location for all other, **global** visibility

Describe the 3 way check & responsibilities

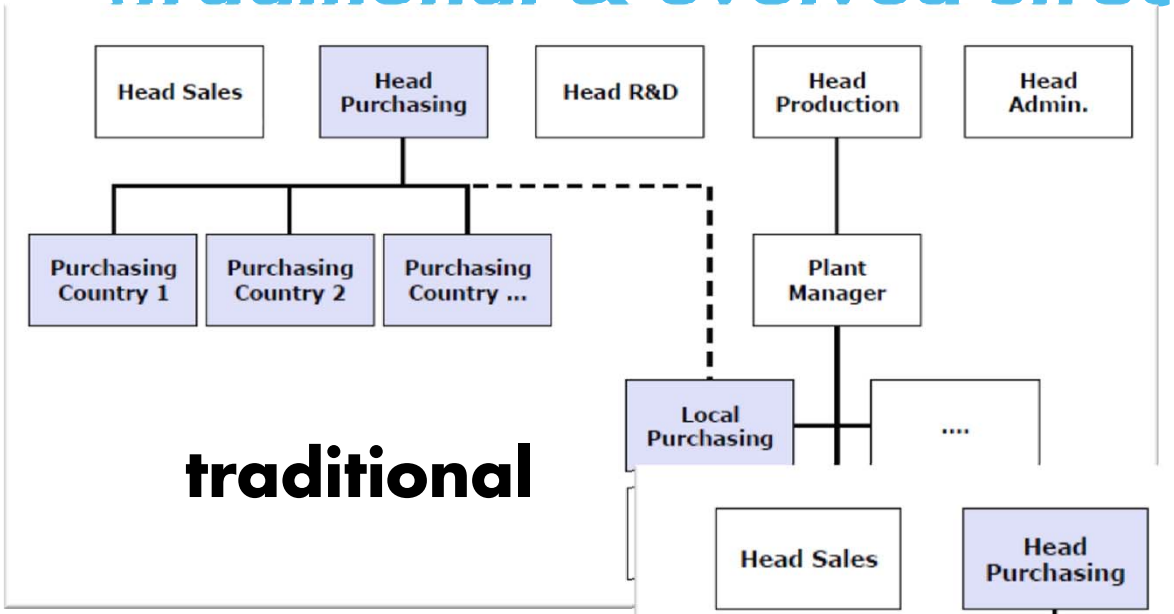
For production materials, supplies, consumables:

- Purchasing – negotiates, agrees price
- Receiving – authorises payment
- Accounts Payable – invoice control & payment authorisation

For special orders, IT, Services, Capital goods:

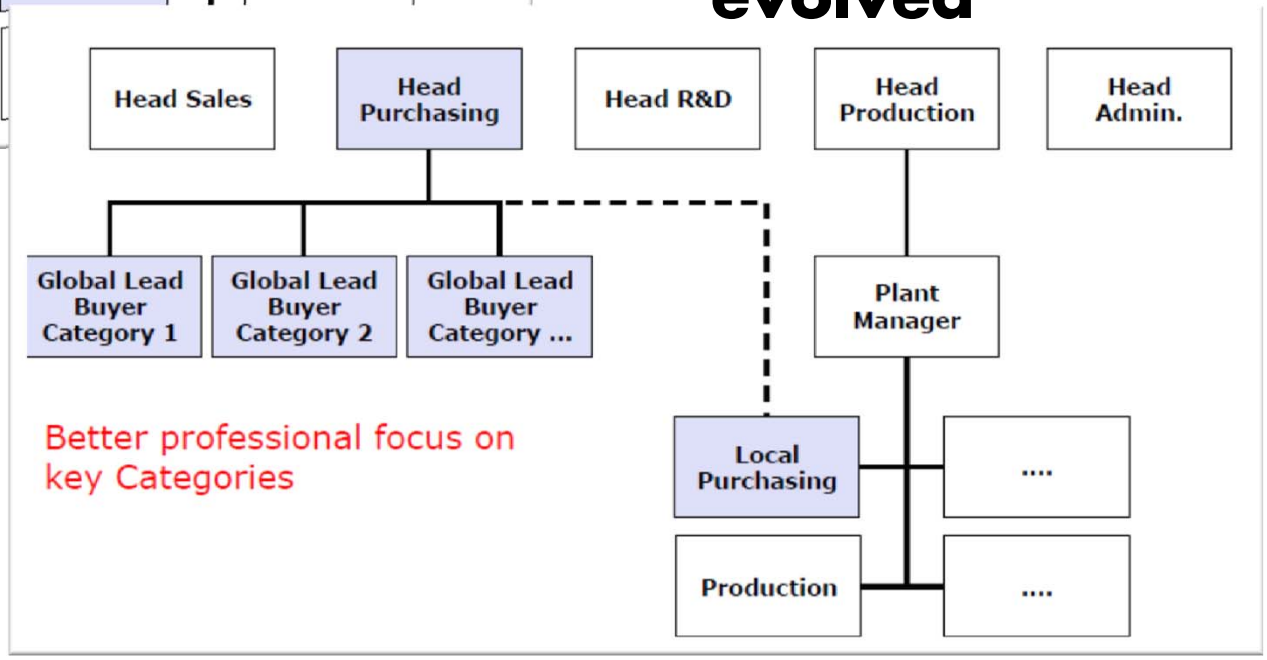
- Purchasing – negotiates, agrees price (not always)
- Requestor/ User – agrees price, authorises payment
- Accounts Payable – invoice control & payment authorisation

How is Purchasing organised? (traditional & evolved structure)



traditional

evolved

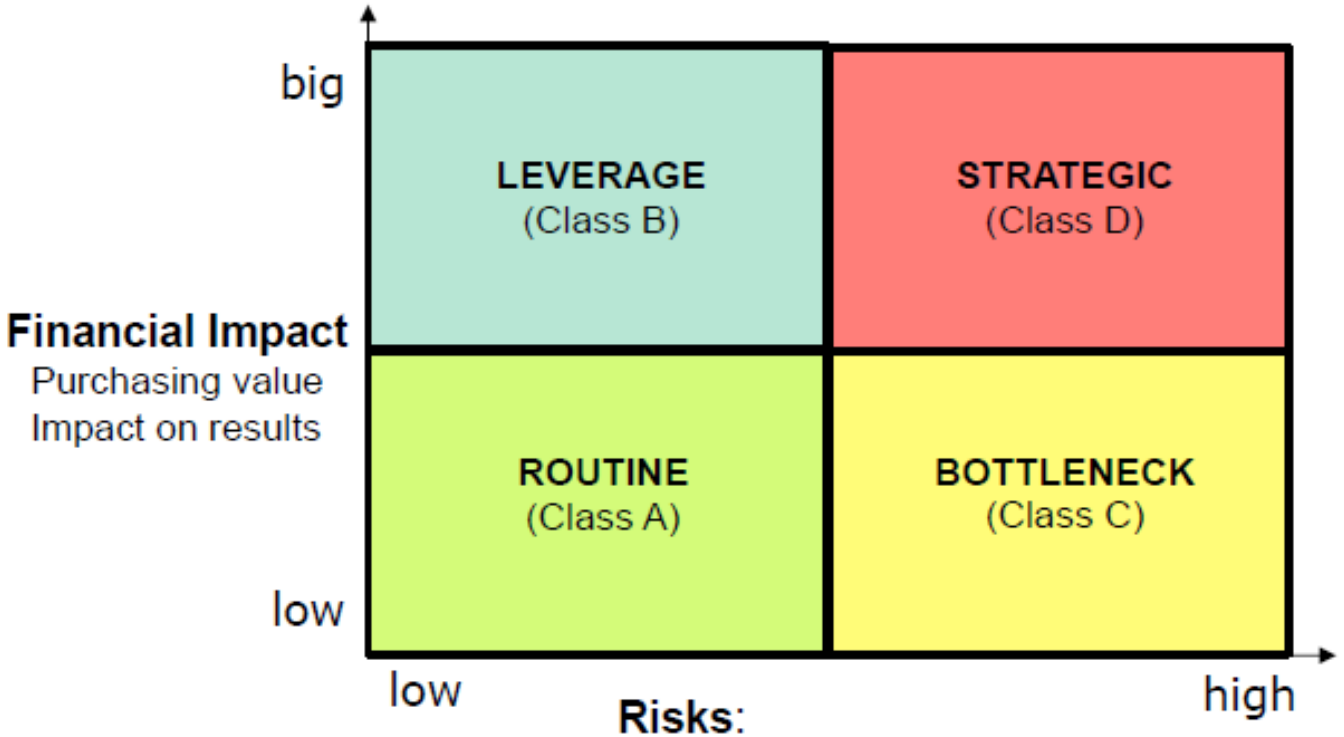


What is the Purchasing Managers' Index? Why is it useful?

- PMI is a weighted index → leading indicator, tells in advance what's going to happen (zu deutsch: Frühindikator)

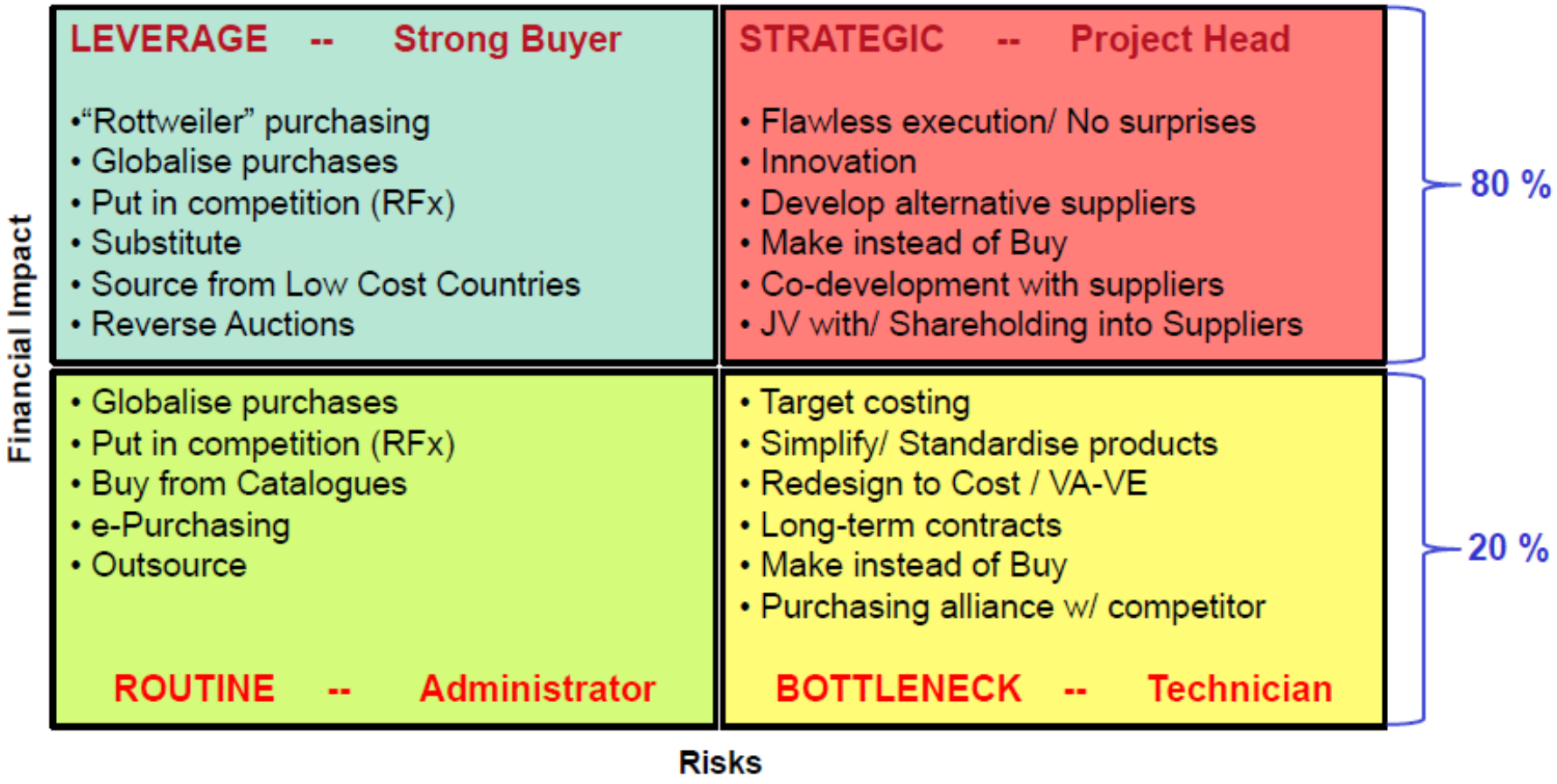
- The concept behind the PMI is quite simple and has been used successfully in the US for over 50 years. Each month, over 200 purchasing managers at Swiss industrial companies are asked about their performance in the current month compared with the prior month.

Describe the 4 classes of the purchasing matrix



Risks:
Hi technical/ quality specifications
Non standard parts
Non recurring supply
Hi know-how/ competences
Long delivery time/ service
Hi confidentiality/ IP protection

Who is the best purchaser for each of the 4 purch. classes?



Advantages and disadvantages of Purchasing Auctions

- Advantages
  - Dynamic
  - achieves rapid downward price pressure
  - Real-time price disclosure increases transparency

- Disadvantages
  - Cruel process → supplier doesn't like it

Why try to standardise purchases?

- Cost savings → Effective Purchasing is a "source" of EBIT

- documentation of the current process
- reductions in variability
- easier training of new employees
- baseline for improvement activities.
- adds discipline to the culture
- learning tool that supports audits

OPS Week 8:

Checkpoint

List the 7 deadly wastes

- The 7 types of waste ("Muda")

1) Excess production	Manufacturing parts in excess of customer demand or manufacturing them too soon
2) Motion	Unnecessary worker/ machine moves, excessive handling within a production cell
3) Waiting	Machines/ people idle instead of processing (unbalanced cycles, breakdowns, delays, waiting for materials feed…)
4) Conveyance	Transporting further than necessary or temporarily locating, restocking and moving parts again
5) Overprocessing	Performing additional work not normally necessary – to overcome ineffective design, methods, materials, tools, procedures
6) Inventory	Keeping inventory (which freezes cash that could be used elsewhere for production)
7) Defective production	Rejects, reworks, deviation from standards, repairs

What is the meaning of "value adding activity"?

- **Value added**: What customers are willing to pay for the functions of the products they buy

- e.g. Wood cutting:
  - Value adding activity is sawing the wood, others like cleaning, waiting and quality control are non-value adding

List the "5S" steps (in english)

1) ***Sort***. Separate the necessary from the unnecessary; first tag then get rid of the useless tools, work in process, machinery, products, papers, and documents

2) ***Set in order***. Put needed tools and material in a set place and keep things in order, so that what is needed to do the job is found without wasting time looking (markings on floor or tools tables…)

3) ***Shine***. Keep the workplace clean, so problems are avoided or easily spot (no dust, fluids, debris…), make cleaning part of daily machine inspection and small maintenance tasks (e.g lubrication) part of operators' work

4) ***Standardise***. Define working standards. Deviations are easily seen

5) ***Sustain***. Adhere with discipline to standardized work procedures

Where can you obtain information about suppliers or competitors?

Market Intelligence

- Primary sources
  - Own experience, direct contacts
  - Questionnaires, Surveys
  - Request for Quotations, Product tests
  - Site visits

- Secondary sources
  - Annual reports, Website, Marketing publications of the company
  - Intelligence reports of market Research institutes and Banks
  - Business Databases
  - Public reports/ filings
  - Literature, magazines

What is Market Intelligence and what are its advantages?

→Have information how the market works

→You can benchmark with competitors

Market intelligence' is the information relevant to a company's markets, gathered and analyzed specifically for the purpose of accurate and confident decision-making in determining market opportunity, market penetration strategy, and market development metrics.

1) Define a process for capturing market data, evaluate it and select key information
2) Use reports for management discussion and action

- **Input to Strategic Planning:** Use the information gathered on competitors and suppliers to better develop your strategy
- **Input to Strategic Sourcing:** Use the information gathered on suppliers to better develop your strategy

What is "breach of warranty"? And which are the 3 categories of product defects for which a manufacturer is liable?

- Warranties are promises of the manufacturer or seller about his products during a commercial transaction
- **Breach of warranty happens when products do not fulfil:**
  - **an express warranty (contractual specification)**
  - **an implied warranty of quality, feature or "fitness" for a specific purpose, as commonly expected for such products**
- In case of breach, the contract is still in force, but the buyer can claim: performance (repair or substitution), reduction of the purchase price, withdrawal and/ or damages

Liability for Product Defects

- **Manufacturing defects**: occur in the manufacturing process and are caused by poor materials or processes or both
- **Design defects**: if products are inherently dangerous (or useless) by design, fail to satisfy normal safety expectations or they risks outweigh their benefits – no matter how well manufactured
- **Failure-to-warn defects**: the products carry inherent non-obvious dangers which could be mitigated through adequate warnings to the user – no matter how well designed and manufactured

What is Cycle Time? Takt Time? Lead time? What is their difference?

- **Cycle time:** Time elapsed between two products coming out of the same production cell.
- **Takt time:** Time at which products must come out of a production cell in order to exactly satisfy the customer's demand
- **Production Lead time**: Time needed by an "identified" part to go through the whole production process from beginning to end (starting from its initial components) – (*Also called: Throughput time)*

List and explain the 4 basic production types

Production	Volumes	Product variability	Equipment Flexibility	Examples
Job shop	1 piece to very few	Highest (custom)	highest	Toolmaking
Batch/ Group	medium	high	mid	Metal parts workshop
Flow	high	few variants	limited	Car assembly
Continuous	highest	minimal to none	almost none	Paper mill

For a successful 5S, managers must allow workers to take

- Responsibility?

What are the two evils in Production? (remember Deming)

- Demand Variations
  - Internal variations: rework of parts, breakdown of machines etc.
  - External variations: all changes applied by each member of the supply chain

- Waste

Why Japan embarked into Kaizen?

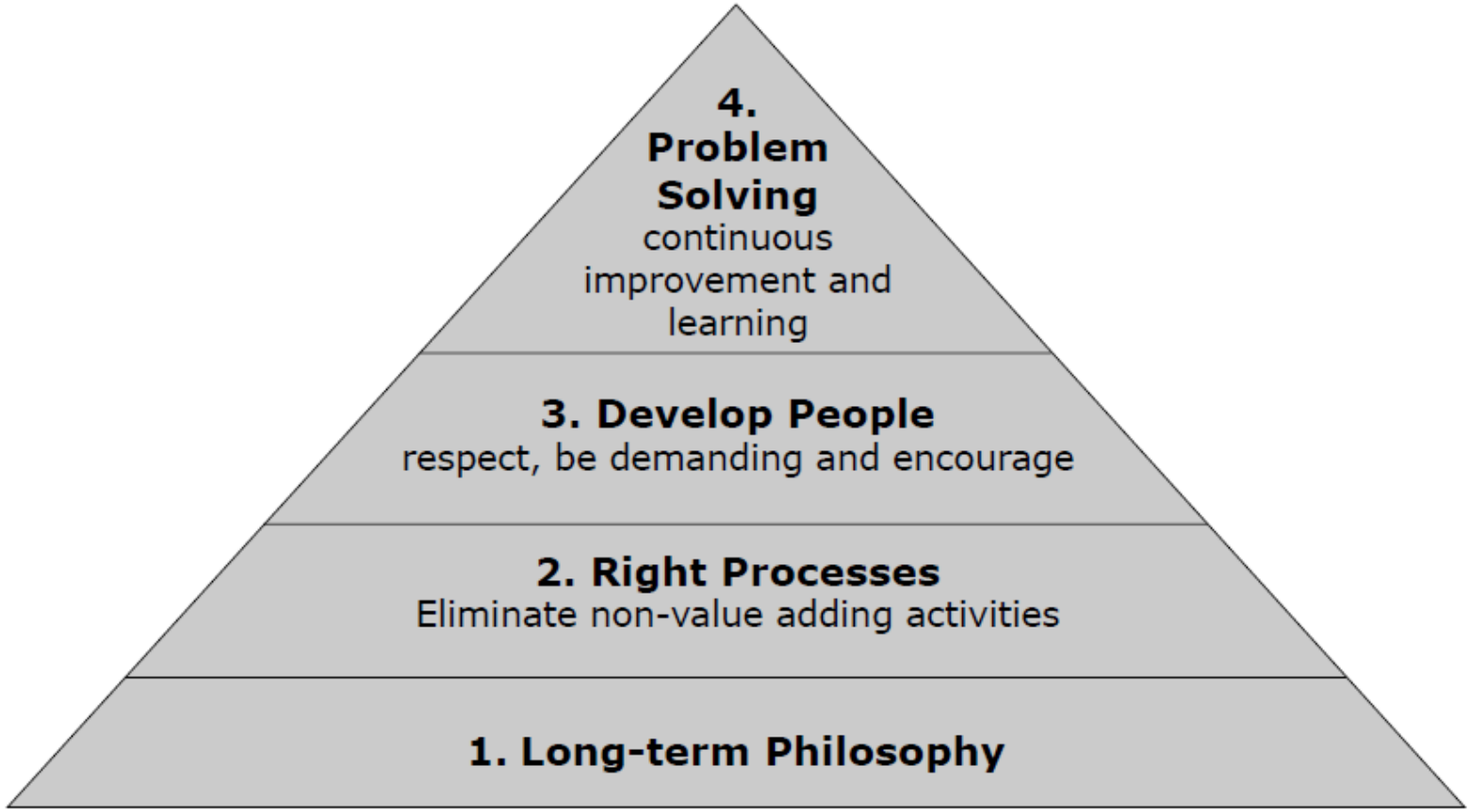
- Japan once a powerful nation was basically destroyed after WW2
- In such a condition every new idea and change was easily accepted
- Japanese looked around and decided to learn from USA manufacturers
- **Their pragmatic culture and step by step approach led them to "reinvent" the approach to production, increasing the value added in each operation, with focus on the customers' needs**
- Funny enough, they extensively used US and EU quality gurus, who weren't (then) much heard in the western world
- In the 70s the western reaction was: "they do not play fair"

What are the principles of the Toyota Production System?

- Improvement of the whole production chain
- Continuously elimination of waste, fluctuations and inflexibility
- Companys future is important

Toyota Way

The Toyota Way: 4 P's



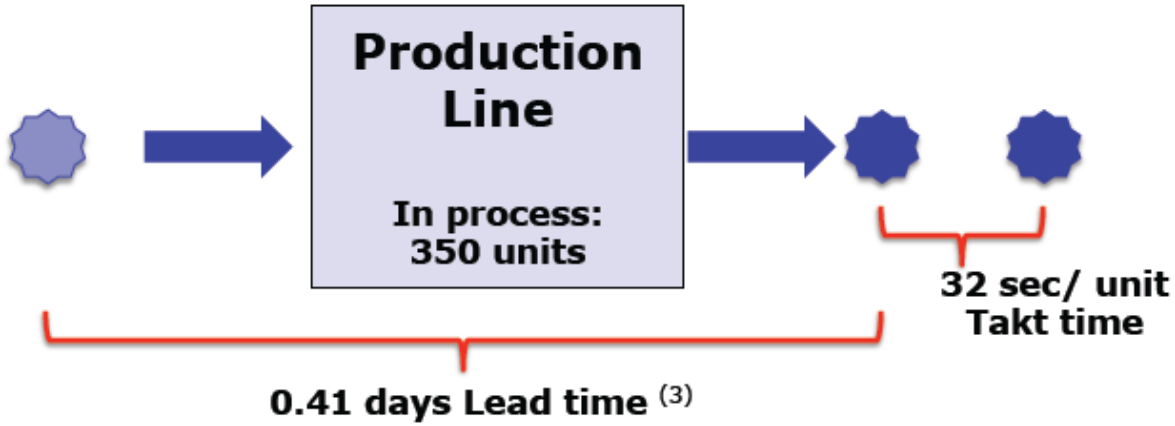
What differs between traditional production and the Toyota way?

Traditional approach	The Toyota way
People make mistakes	Processes cause errors
Single employee is responsible for errors	All employees are responsible for errors
Product quality is tested at the end of production	Quality starts from the beginning
Objective = Improvement of efficiency	Objective = Competitive advantage through quality
Zero errors are not achievable	Zero errors is the objective
Purchase from many suppliers	Partner with few suppliers
Customers have to accept the quality level offered	Customer satisfaction is key

OPS Week 9:
Checkpoint

Put in relation Takt time and Lead time

Calculate Lead time via Takt time



Assuming parts are exiting the system at Takt time:

LT (days) = Units in system (1) * Takt time (sec/unit) / available sec per day

= Units in system (1) / cust demand per day (1)

1) Consider all different products passing through the same process
2) Attention: converting a working day in seconds: use the "available sec per day"
*3) This example: 1 shift of 8hrs and 30 min of pauses: avail = 7.5*3'600=27'000 sec*
*LT = 350*32=11'200sec or 11'200/27'000=0.41 days*

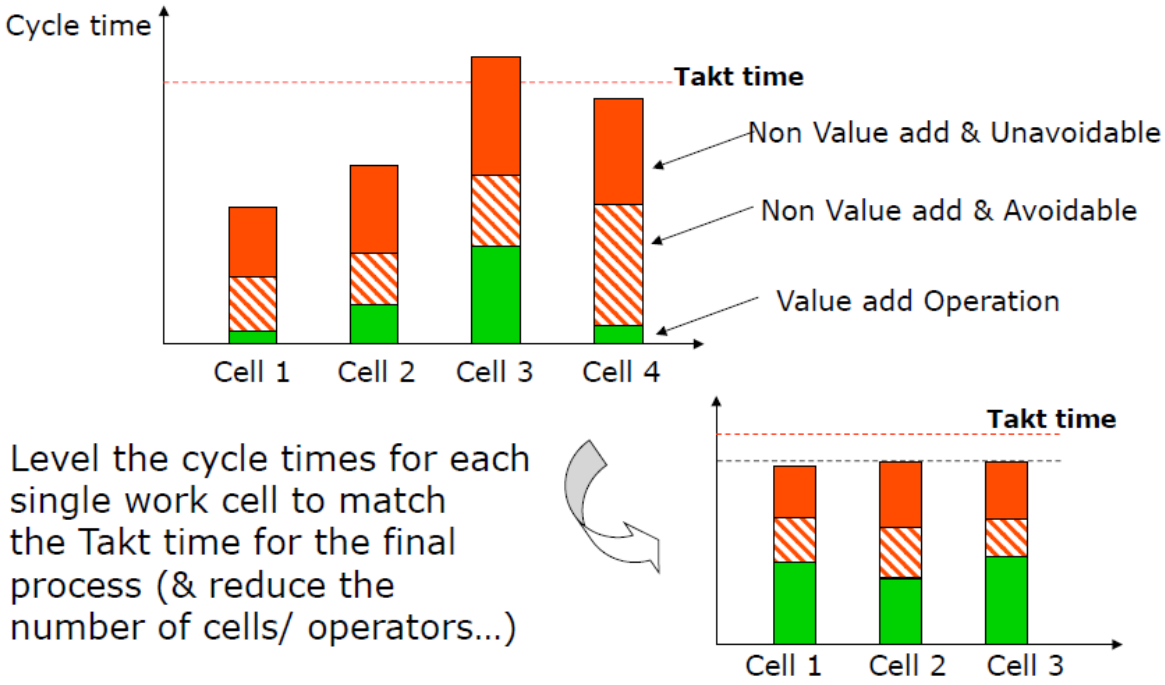
What are the advantages of a U-Cell?

- One operator serves more machines
- Reduce excessive moves
- Reduce space usage

- One piece flow
- Impossible to build intermediate storage
- Multi-skilled operators
- Improves communication

What is production levelling?

- Order peaks & idle running are balanced out through a flexible workforce and if necessary reinforced by partner companies and suppliers
- **Small batch sizes to avoid overproduction**
- **Frequent change of model mix on a given line**



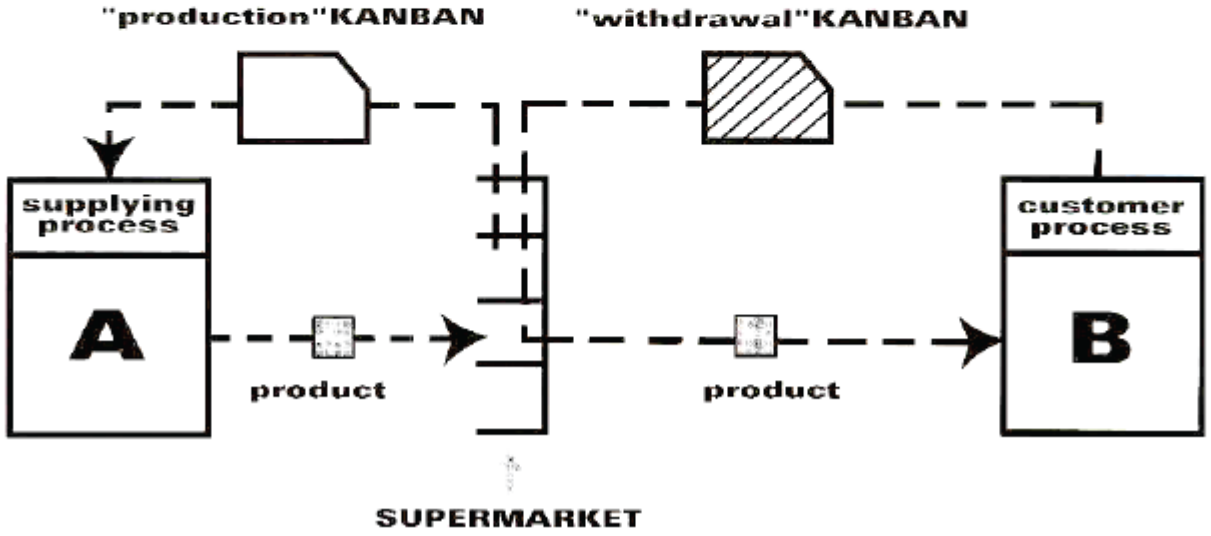
Why is 1 piece flow better?

- Prevent overproduction, waste and inventory
  - No stock in between

- Kanban already reduced in a controlled manner the amount of stock between work stations (stock = #cards * quantity/card)
- Lowering interoperational stock to 1 piece eliminates overproduction fully

Describe how Kanban works

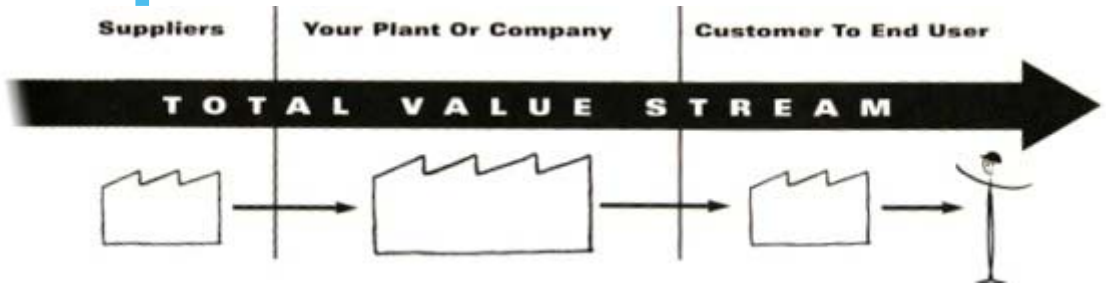
- Customer process, WHEN needing parts, goes to the "supermarket" with their "withdrawal" card and takes the quantity specified by the card – leaving the "production" card in evidence
- Supplying process collects its "production" cards and produces the specified quantity, replenishing what was withdrawn



To manage constraints I have first to identify the _____

Critical Constraints that currently limit the system output = **Bottleneck**

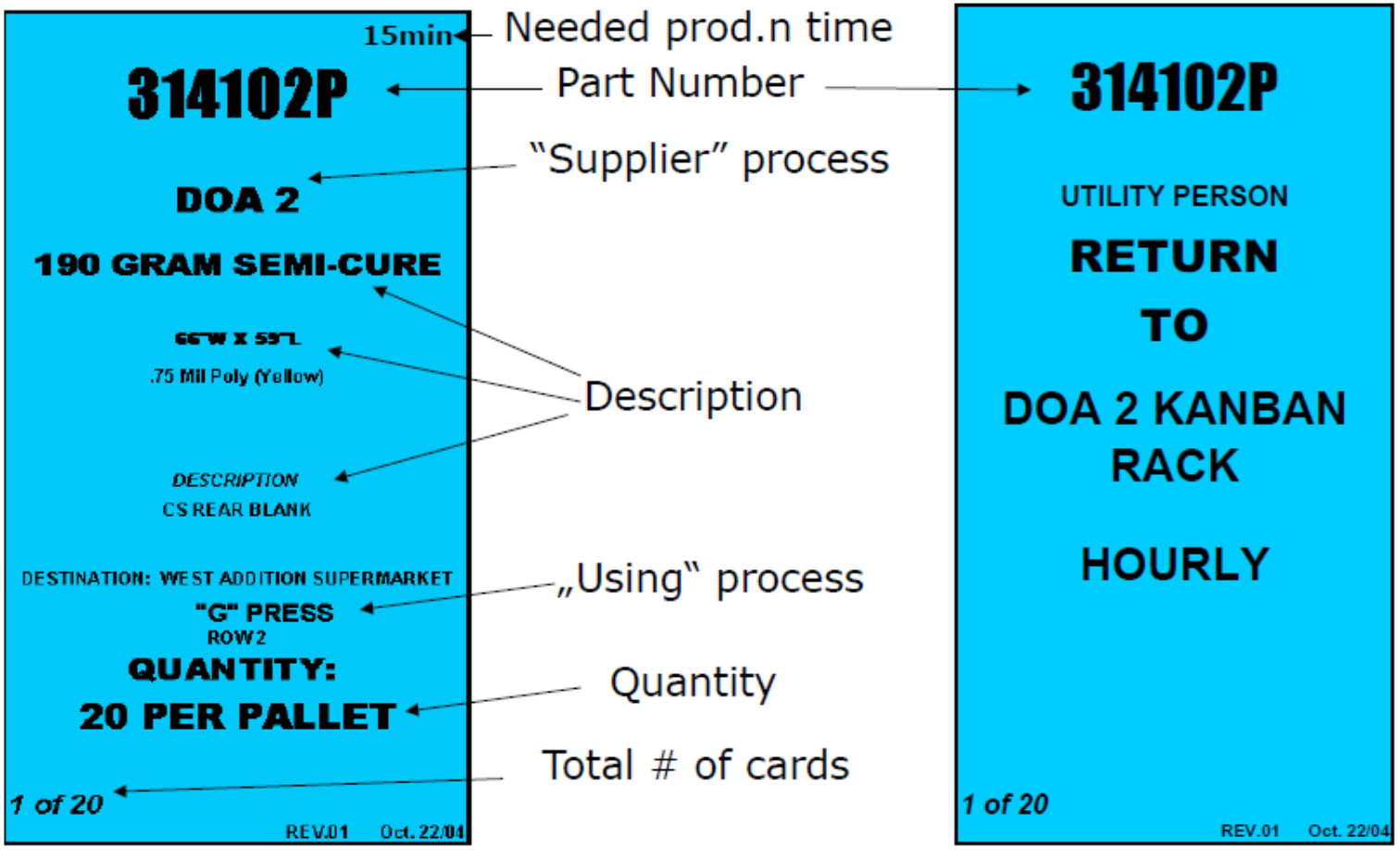
What can I understand and then do with a Current-state Value Stream Map?



- "Value Stream" refers to all activities, VA and NVA, required to bring a product from raw material to finished good
- Activities are converted into a measurement of time as a common benchmarking language for improvement
- **Mapping the value stream helps to quickly view the flow of goods and provides a basis for identifying issues and improving processes**

What minimum information is needed on a Kanban card?

Kanban Card (Kan=Card, Ban= Signal)



Describe the differences between traditional production planning (in "push" mode) and the "pull" mode

Traditional production is "Pushed":

- internal work orders generated by planning activate production from Raw Mat.ls and fill Intermediate and Finished Goods inventories; Logistics picks goods from FG upon sales orders and delivers them to customers
- **Stock levels explode**

The Toyota way is "Pulled":

- Customer orders initiate production of FG, these cascade production backwards; little inventories in between
- A process makes more parts only when the next process withdraws parts
- BUT one must produce at Takt Time, with no disruptions
- **Stock levels stay low**

What is OEE? Which are its 3 components?

- Target for a machine or production cell is to maximise the Uptime of machines (no breakdowns), their efficient Use for production, their Quality output. OEE shows all this in one number.
- → A low OEE indicates a machine or workcell that needs attention

- **OEE = Overall equipment effectiveness → tells if we are on track**

OEE = Availability ratio x Performance ratio x Quality ratio

- **Availability** = Running Time / Planned Time (*) (or Uptime)
- **Performance** = Units Processed*Std Cycle Time/ Running Time
- **Quality** = Good Units/ Units Processed (First Pass Yield)

What is the ratio Standard Cycle Time/ Actual Cycle Time?

- Std. Cycle Time / Actual Cycle Time = OEE

OPS Week 10:
Checkpoint

Can a Future-state VS map be very different from the current?

- Yes
  - Implement Kanban etc.
  - Guidance → target to reach

- See case ACME

Once identified a bottleneck: what to do?

- Balance them to Takt time
- Reduce Non-Value-Adding activities (waste)

Can you draw examples of cycle time charts on your own?

???

- xyz

Why should Cycle time always be reasonably lower than Takt time?

- If CT too high, you cannot fulfill the requirements of customer → you're delivering too slowly
- If you are too much below TT → waste (high inventory, time loss) → what to do? Stop machines/man power

What is a Focused factory?

An organisational approach that splits a plant into smaller, logical units, focused on customer and designed with lean principles:

- ✓ Minimize material handling and in-process stock
- ✓ Reduce the use of floor space
- ✓ Minimize operator moves
- ✓ Utilize labor efficiently & effectively
- ✓ Eliminate bottlenecks

- They manage autonomously their daily work, with own funds, technicians and performance targets

What are SAWT?

Semi Autonomous Work Teams

- - Human beings are the only long-term advantage of a company: empowerment means releasing the power of each individual allowing him to grow and develop, becoming responsible of his own work area
- Blue collar workers have to fully use also their "minds" at work, not only their "hands"
- Plant and middle managers on the other hand, must accept to "let go" some of their "power"

- NB: TPS is based on people, not on equipment & automation

Which Tool to use if changeover of production takes too long?

- Every Part Every x (EPEx)

- The reduction of setup time and production of smaller batches in upstream manufacturing processes leads to a faster reaction to demand changes in downstream processes.

Which Tool helps prevent occurrence of mistakes in production?

- **Philosophy: Jidoka** is the ability of production lines to be stopped in the event of such problems as equipment malfunction, defects or work delay

- Men aren't machines and everybody makes errors: these may generate defective parts
- Make sure operators really "cannot" do anything wrong

- **Poka –Yoke: "Zero defects" – Prevent errors Implementing simple, low-cost devices that either detect abnormal situations before they occur, or once they occur, stop the line to prevent defects**

- These devices help prevent mistakes by operators leading to defects, machine damage, injury, etc.
- Ideally they are fool-proof enough so that even if an operator is not paying attention he still can't make an error

Provide examples of Visual management

- Standards: methods, quality
- Targets: Cost, uptime
- Progress: toward targets
- Problem: Condition warning
- Defect: Condition warning

Why are standards needed? Give examples

- "**Where there is no standard, there can be no Kaizen**" Taiichi Ohno

- Guarantee same quality, produced by different companies in different cultures
- Same processes, same specification
- Not just in Production, Kaizen can be applied everywhere (HR, Sales etc.)

What is mandatory to do regularly on measuring tools used in production?

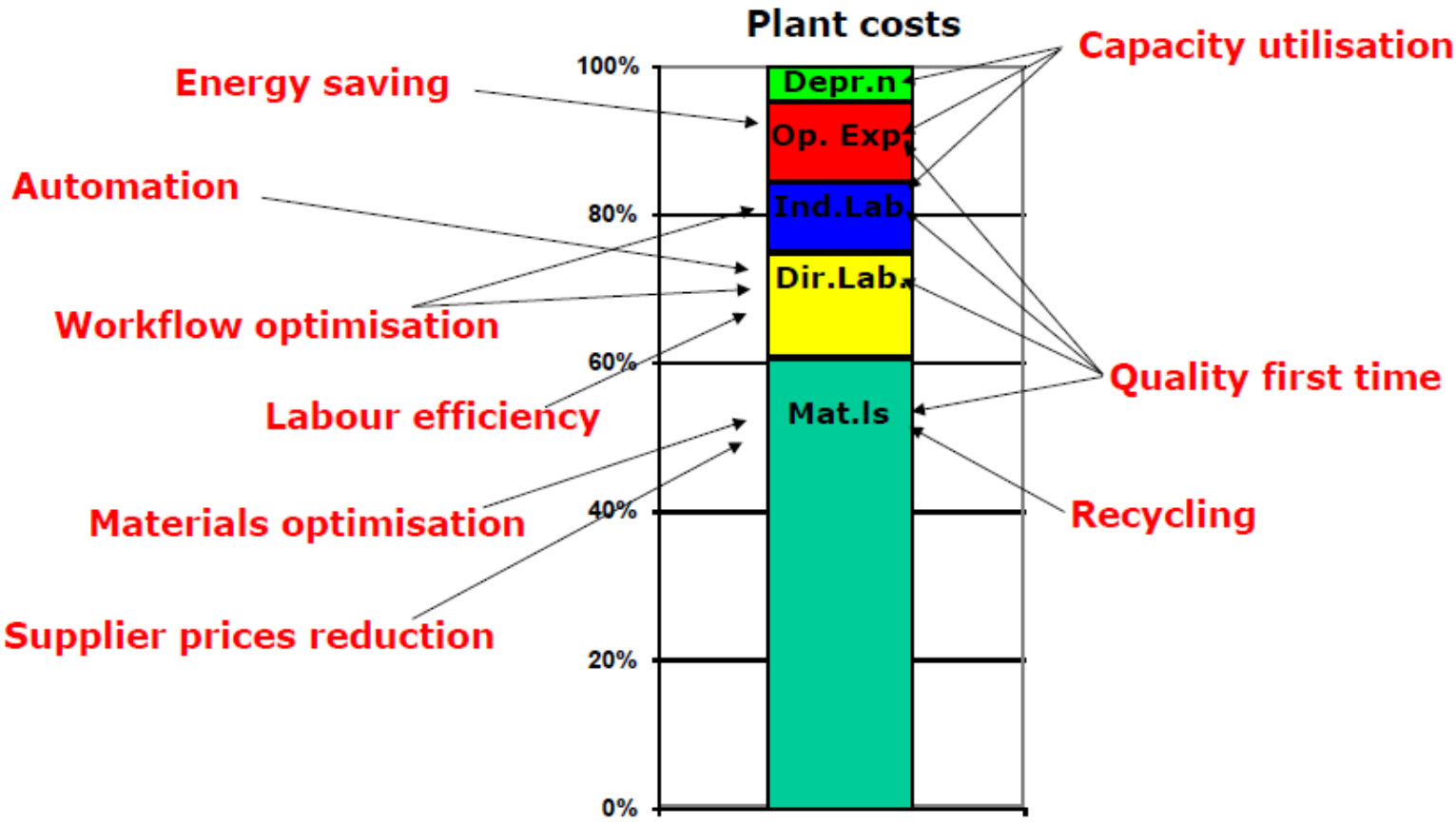
- Regular calibration and maintenance is necessary

What is the use of Information Boards?

- - "Andon boards" **visualise easily for the production** team current production data (e.g. units completed, capacity utilisation…), quality issues (e.g. number and type of rejected parts) or status of improvement projects
- **Objective is to make important facts easily visible to all**
- Team meetings are held near such boards to discuss problems and find improvements in the shop-floor, with the participation of operators and technicians (quality, engineering, maintenance…)

What is the target of VA/VE?

- Turn costs into opportunities



Production improvements can be up to 10% (True/ False)

- True

OPS Week 11:
Checkpoint

Which TPS tools are enablers for 1 piece flow? _ _ _ _ / _ _ _

- **SMED** and **TPM** make 1 piece flow possible

Kaizen applies to production environment, not to services nor offices: T/F

- False, Kaizen is not only for production, it applies everywhere

- **In Development:** a gold mine lies in the design of new products and processes "Design for manufacturing" will help Plants to be "excellent" from day one (instead of correcting after)
- **In the Offices:** all Business Processes can be simplified, made quicker and less bureaucratic

Biggest contribution to Kaizen comes from top educated people: T/F

- False: You need diversity
  - Select a team of approx. 10 people, including cell operators, supervisors, maintenance, technicians, even a salesman

- Continuous improvement is not just for smart educated people: blue collars do bring great results

What are the major hurdles for big Kaizen projects ?

- Obtain management support
- Boss is always right! :D
- Beware of New-Idea killers

What is the role of Communication in a Kaizen initiative?

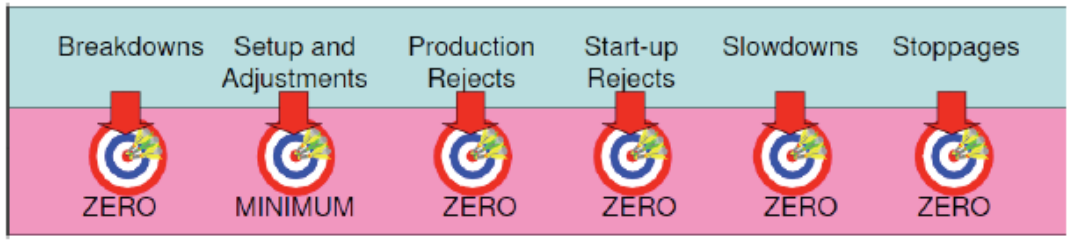
- Communication is very important and plays a major part
  - Road Map, FAQ, Guidelines
  - Kaizen Newsletter (Why?, KW Progress, Implementation, Show contributions)
  - Manufacturing Trophy (put plants into competition)
  - Certificates and gifts for Kaizen Week participants (T-Shirts etc.)

You are nominated Kaizen responsible: what will you make sure to obtain?

- Top management support

TPM means? Who is asked to perform TPM tasks?

- **TPM = Total Productive Maintenance**
- Prerequisite for JIT are machines that do not break down: rapid maintenance after breakdown is not enough
- **Maintenance to prevent breakdown and activities to predict breakdowns become necessary**
- Push responsibility onto **Operators** allows Maintenance technicians to focus on complex tasks



Stop production when YOU want to

NOT because the machine broke down

Give examples for Costs of non-quality

- Premium freight for urgent inbound delivery of materials/ components
- Rework and associated material losses (material inefficiency)
- Line disruption or Line changes due to material non-availability
- **Downtime** of equipment, Line speed reduction
- **Additional manpower to overcome process inefficiency**
- **Overtime** or outside processing to overcome scheduling issues
- **Delays** due to increased number of changeovers (due to rescheduling)
- Misidentified parts, Sorting, Shipping documentation errors
- **Excess inventory**
- **Premium freight for late production**
- Rework at customer premises, travel, manpower, replacement of material at customer's
- Costs of internal containment actions (added inspection, re-certification of products, etc.)
- Debit of customer's internal costs due to our delivery delays
- Product modifications not carefully planned/ managed

Safety is the responsibility of each individual in a plant T/F

- True

- But, company has to reduce unsafe conditions

What are the main categories/ root causes of safety accidents?

Unsafe Conditions (do not depend on people)

- Not guarded/ not protected equipment
- Faulty equipment
- Hazardous procedures
- Unsafe storage of hazardous materials
- Untidy work areas, slippery floors
- Inadequate lighting/ ventilation

Unsafe Actions (wrongdoing of people)

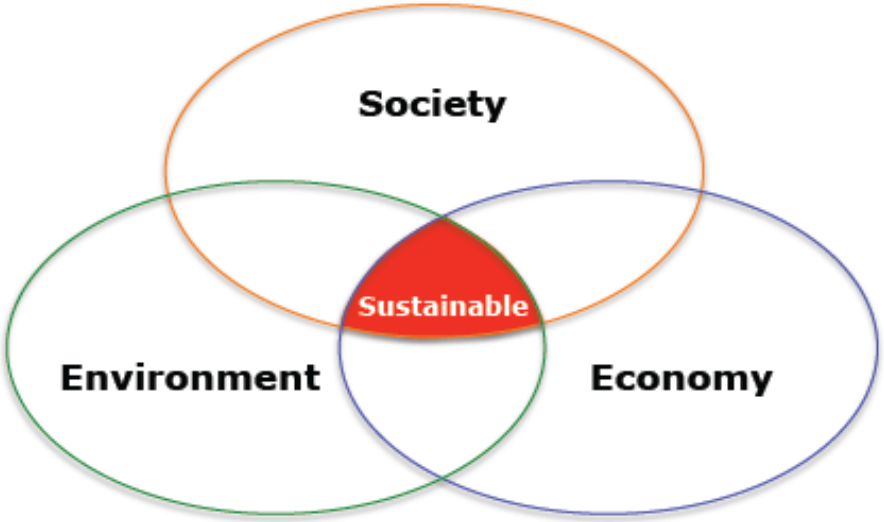
- Procedures not followed
- Inappropriate use of equipment
- Personal Protection Equipment not used
- Stress/ Burnout

What is a Kaizen week?

- One intensive, focused week without disturbance
- A team of people (cell operators, maintenance, others) “dirtying their hands” in a production cell to improve it
- Simple solutions, no investments
- Measurable improvements at the end of one week
- Highly motivated participants
- Example for all others employees (“it works!“)
- A tool to accelerate improvements and spread training

What are the 3 components of Sustainable businesses?

- Business Excellence is today more that just managing at best your own operations
- Interrelationships in our world are complex and wide ranging; they force us to widen the angle of our vision
- Sustainable development must meet our present needs without compromising the ability of future generations to meet their own needs



OPS Week 12:

Checkpoint

Can you draw examples of cycle time charts on your own?

- See exercise solutions

Can operations for one part be executed in parallel? Give examples

- See exercise solutions

- Yes
  - Prepare next step while machine is running
  - If you can run operations in parallel, optimizes Standard Lead Time

What is the impact of setup-time on the total Lead Time for a part?

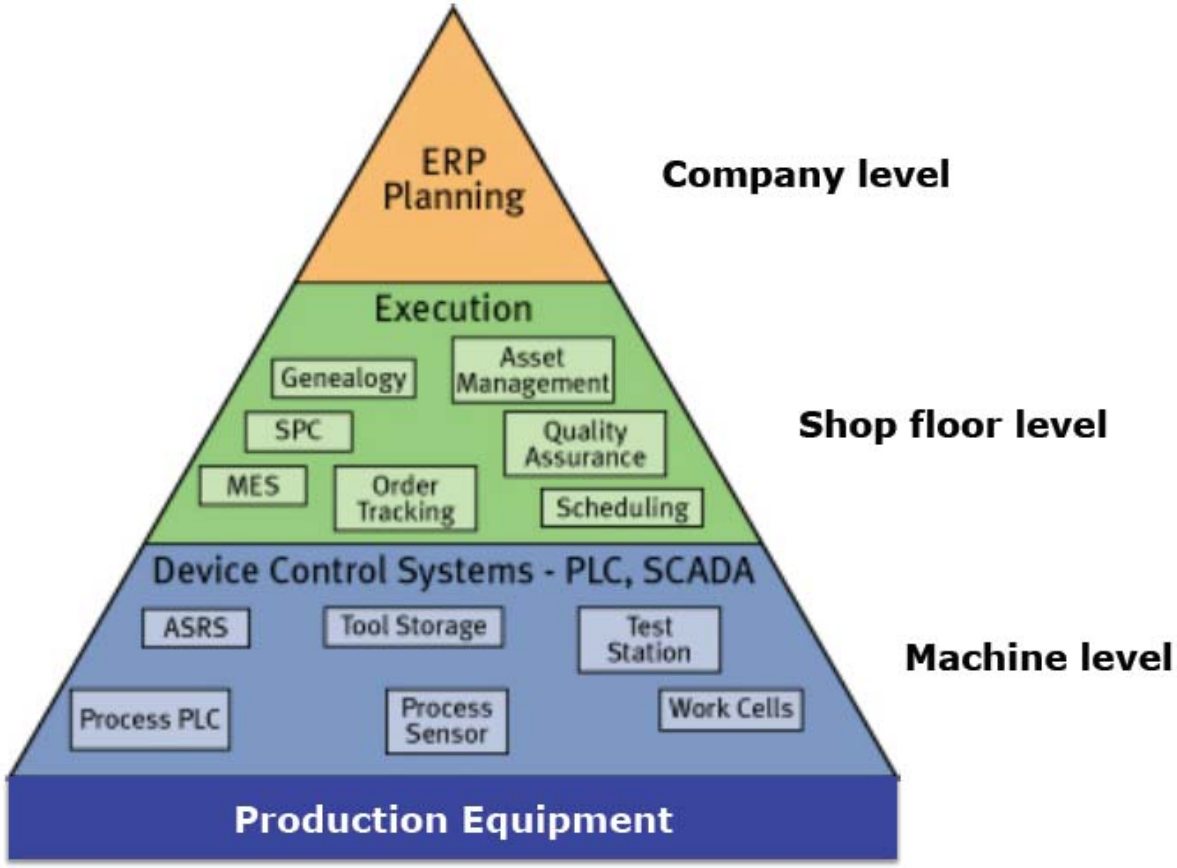
- See exercise solutions
- Lead Time increase

What relation has OEE with actual cell production?

- With OEE we calculate the realistic production capacity of a work cell
- **Low OEE does limit the possible output**

Can production planning at machine level be done by ERP systems?

- Yes



Which cost types are harder (and more controversial) in their attribution to products? What is a variable cost? What a fix? Is fix always fix??

- Fixed costs are allocated and therefore not precise (allocated by rule or by percentage of sales)

Direct costs	vs.	**Indirect costs**
Direct material		Indirect materials (Consumables)
Direct labour		Indirect labour and salaries
		Utilities (Electricity, Gas, Heat, Water, Steam…)
		Maintenance & Repair
		Other Variable Expenses
		Building rental
		Depreciation of Equipment
		Other Fixed Expenses

Variable costs	vs.	**Fix costs**
Dependent on Production Volume		Independent of Production Volume

Is Standard product cost independent from production volumes?

- Dependent

- Based on standard unit costs and volumes

Does Cost Accounting represent reality without distortions?

- No

- Distortions due to traditional Cost Accounting techniques can be corrected by more accurately representing the reality in the CA system
- The difficult part is always the correct allocation of Overhead costs
- The key is to make sure that all activities and cost elements related to a given product enter its cost structure –> so the idea of Activity Based Costing (ABC)
- Tracking the activities that contribute to the creation of a product is the best way to determine its costs. This is not always easy and is seldom done on a continuous base for accounting; it serves more for ad-hoc verifications of the cost base and for decision purposes

One cannot calculate the product cost without:

- *a. BoM*
- *b. Routings*
- *c. Cost Rates*

OPS Week 13:

Checkpoint

What is the purpose of a chart? What should you never do with charts?

- Charts help to "see" the facts
  → but: there must be a clear message, readability

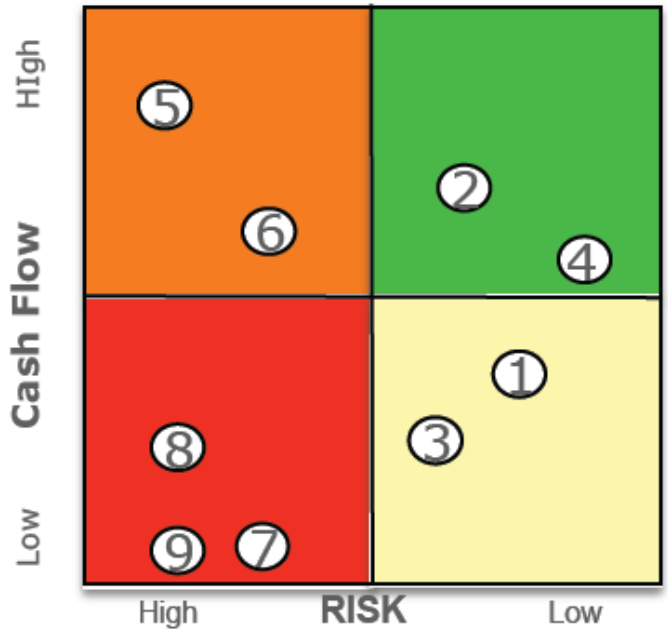
Corollary:

- You do not need to show your artistic abilities
- If you can simplify it, the better
- No need for 3D charts
- Do not confuse the reader with many colours
- Do not play games with scales and proportions
- Always explain axes
- Labels, titles, legends are not the prominent information

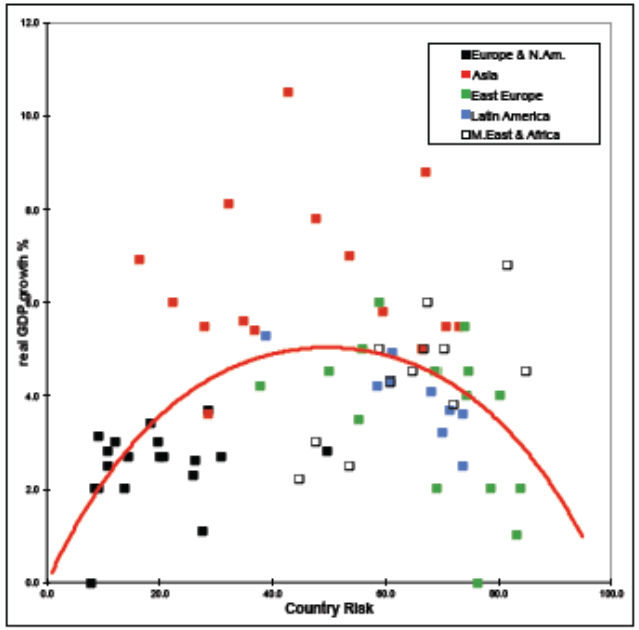
What is a scattergram?

- **Scattergram shows relationship between 2 variables**

Cluster and Select



Identify Correlations



What does KPI mean? Give some examples of plant KPI

- KPI = Key Performance Indicator(s)

Examples for operational KPI:

- Number of new customers, lost customers, lost orders
- Number of quotes on time
- Customer ppm, First pass yield, Supplier ppm
- Sales % with products younger than x years
- First year failure rate, Warranty costs in % of Sales
- Equipment utilization (OEE)
- Inventory in days
- On-time delivery
- Cost of Quality
- Employee turnover, Training hours per employee
- Number of calls solved at first call (e.g. IT hotline)

Why reporting operational KPI? Aren't financial KPI enough?

- Financial data are important to manage a factory, but unfortunately are available only monthly and (depending on the speed of the closing) few days if not few weeks after month end
- Financial data do not go deep enough into the key phenomena related to production

- → Plant KPIs are "close to the facts" and help to "see" early enough (if well chosen) the effects of a bad performance
- → They help search for the causes and eliminate them – they allow counter actions be taken before the monthly closing

What is a Management review?

- They collect data & show results, define actions and risks
  - Top management shall review the organization's quality management system, at planned intervals (*), to **ensure its continuing suitability, adequacy and effectiveness.**

- This review shall include assessing opportunities for **improvement** and the need for changes to the quality management system, including the quality policy and quality objectives.
- Records from management reviews shall be maintained

(*) normally on an annual basis

What is the driver of the transfer of production to the East?

Reasons for moving East

1. Cost advantages (Low Labour Costs, LLC)
2. Entry in new growing Markets
3. Higher flexibility in supply
4. Reduction of shortfalls in capacity
5. State subsidies, taxation benefits
6. Proximity to customers who moved East already

Is a move to East equally useful for all industry segments?

- No
  - High standard production / Ultra High Tech remains locally

What can keep Manufacturing in CH successful?

- Build on typical Swiss strengths: **quality, precision, self-initiative, innovation, reliability**
- Strive for Continuous improvement and Innovation, to keep a competitive advantage
- A sustainable role:
  - Innovation centre for new Products, Processes and Methods
  - Competence centre for core and new technologies
  - Platform for development and transfer of knowledge
  - Focus on the most complex and capital intensive production activities

What is Reshoring? What are the reasons for it?

- Reversal of outsourcing; the transfer of a business operation back to its country of origin.

Some reasons:

- Better quality controls
- Better response to changing demand
- Better logistic performance
- Shorter time to market, better internal collaboration
- headcount reduction, better quality, greater control

What keeps operation heads or plant managers awake at night?

- Plan & Control
- Organisation
- People
- Quality