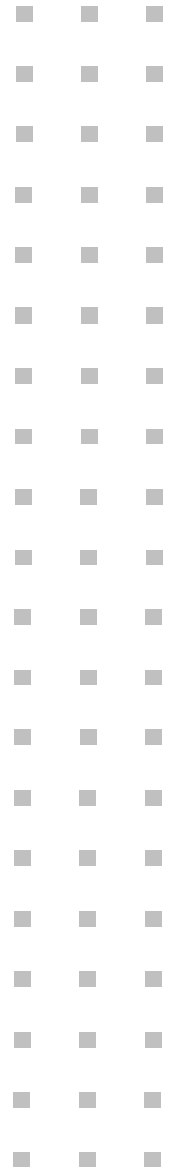




Warehouse Management

Do's en Don'ts in Warehouse Design

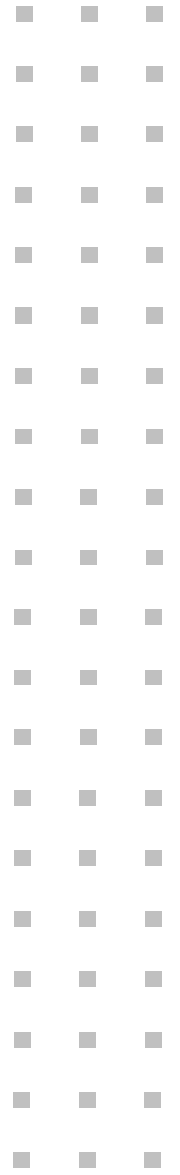
23 november 2010
Versie 1.0



Agenda



- **Introduction**
- Cases
- Approach
- Basic data
- Techniques
- Evaluation
- Questions



Design and Construction Logistics centers



- Distribution centers
- Warehousing
- Cross Dock centers
- Value added logistics
- Packaging



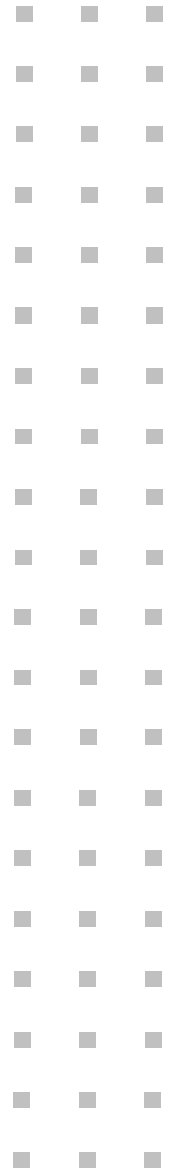
- Logistics design
- Simulation
- Mechanical Automation
- Warehouse Management



Agenda



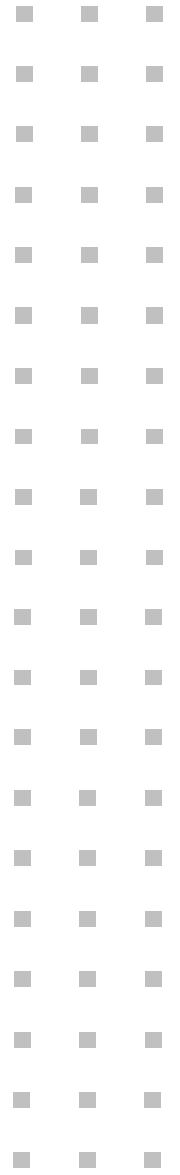
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Cases



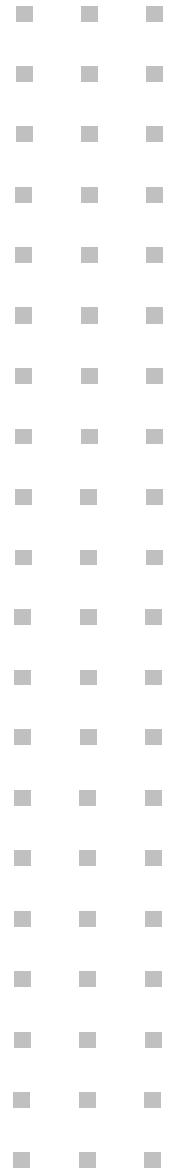
1. Spare parts motor cycles
2. Spare parts Copying machines
3. Kitchens
4. Fresh products.



1. Functional Flow diagram
2. Design 2 different alternatives for the process
 - a. Calculate Storage areas
 - a. Per separate group of articles
 - b. Draw a scaled sketch layout
 - c. Give benefits and disadvantages of each of these alternatives
 - d. Draw a detailed flow diagram for these alternatives
 - e. Make decision for the preferred alternative
3. Calculate number of FTE's fro prime alternative
4. Describe order picking methods
5. Make a more detailed layout drawing

Report including:

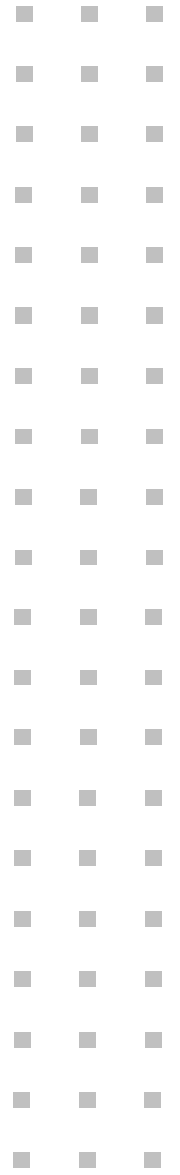
- Process description
- Investment cost overview, operational cost estimates



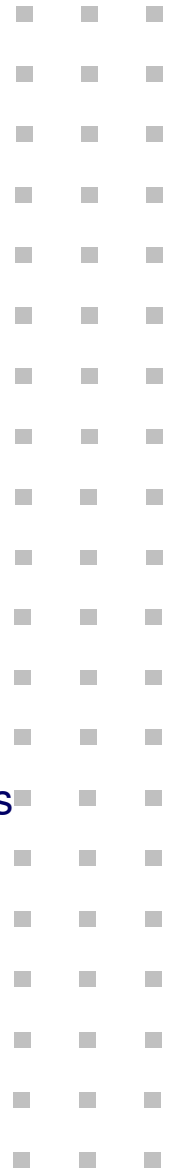
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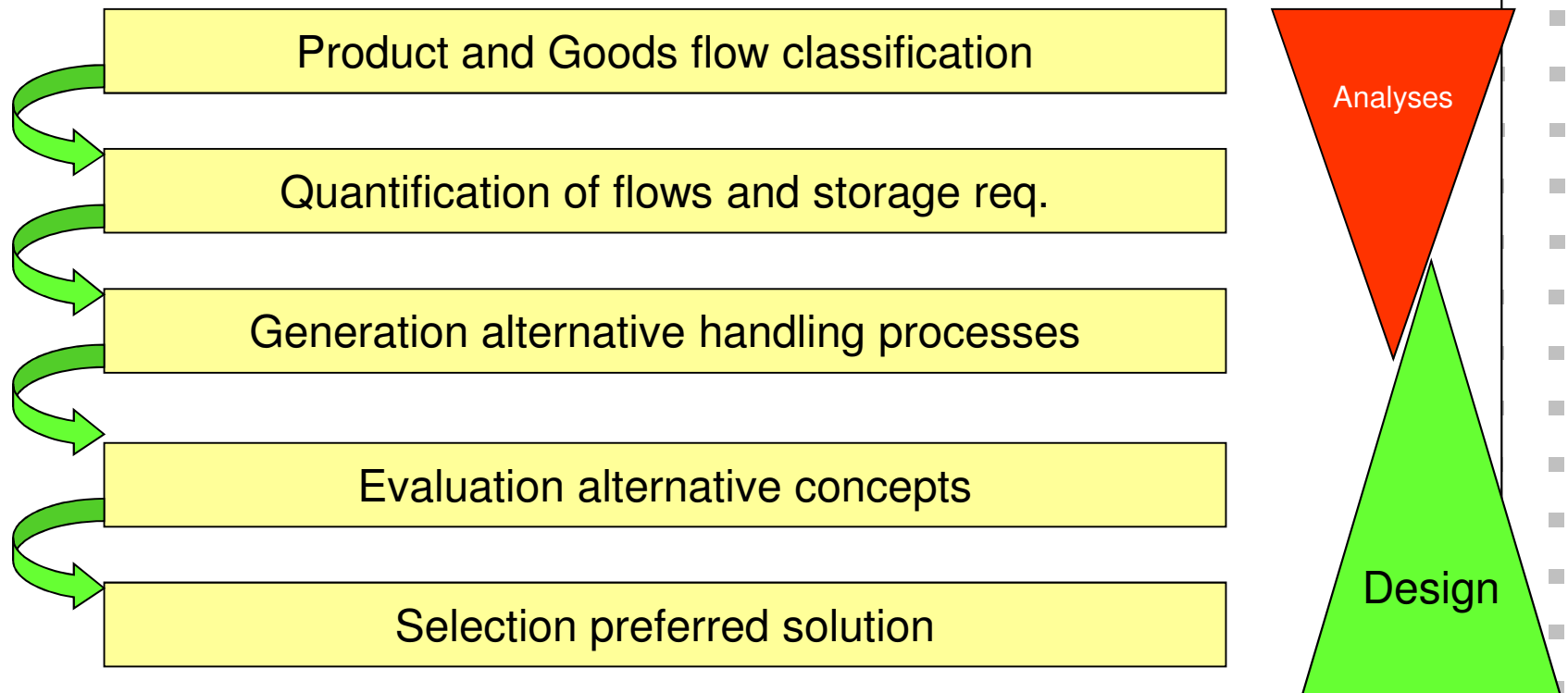


- Most common mistake that is being made is that people don't follow the right approach
 - We know the solution already
 - Already seen a solution in another environment
 - Too less time for proper analyses
 - Too much focussed on problems in current situation that need to be solved
 - Assuming that people who work daily in the operation will know the right requirements for a new warehouse => but do they know the right quantitative data?

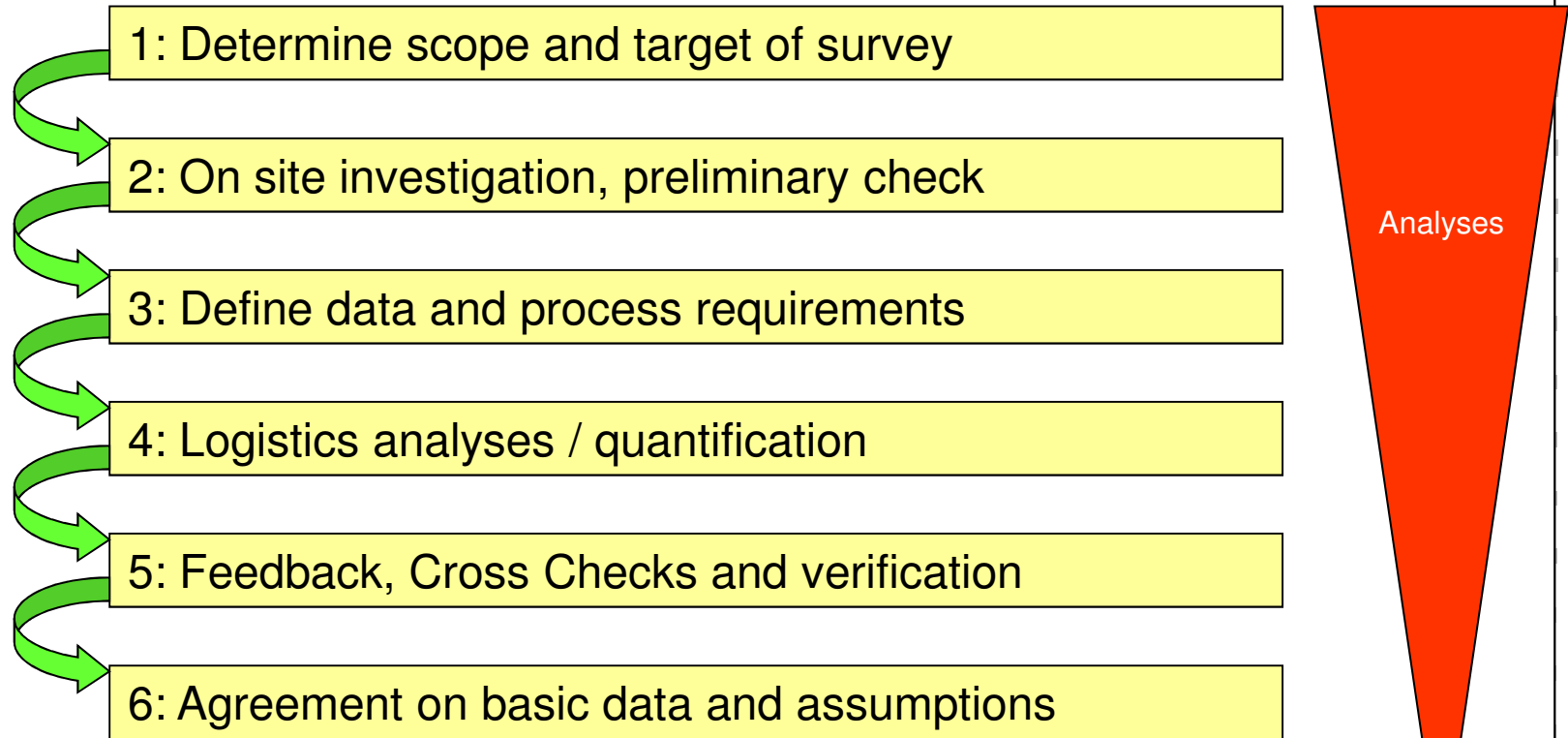


Approach: Method of Muther

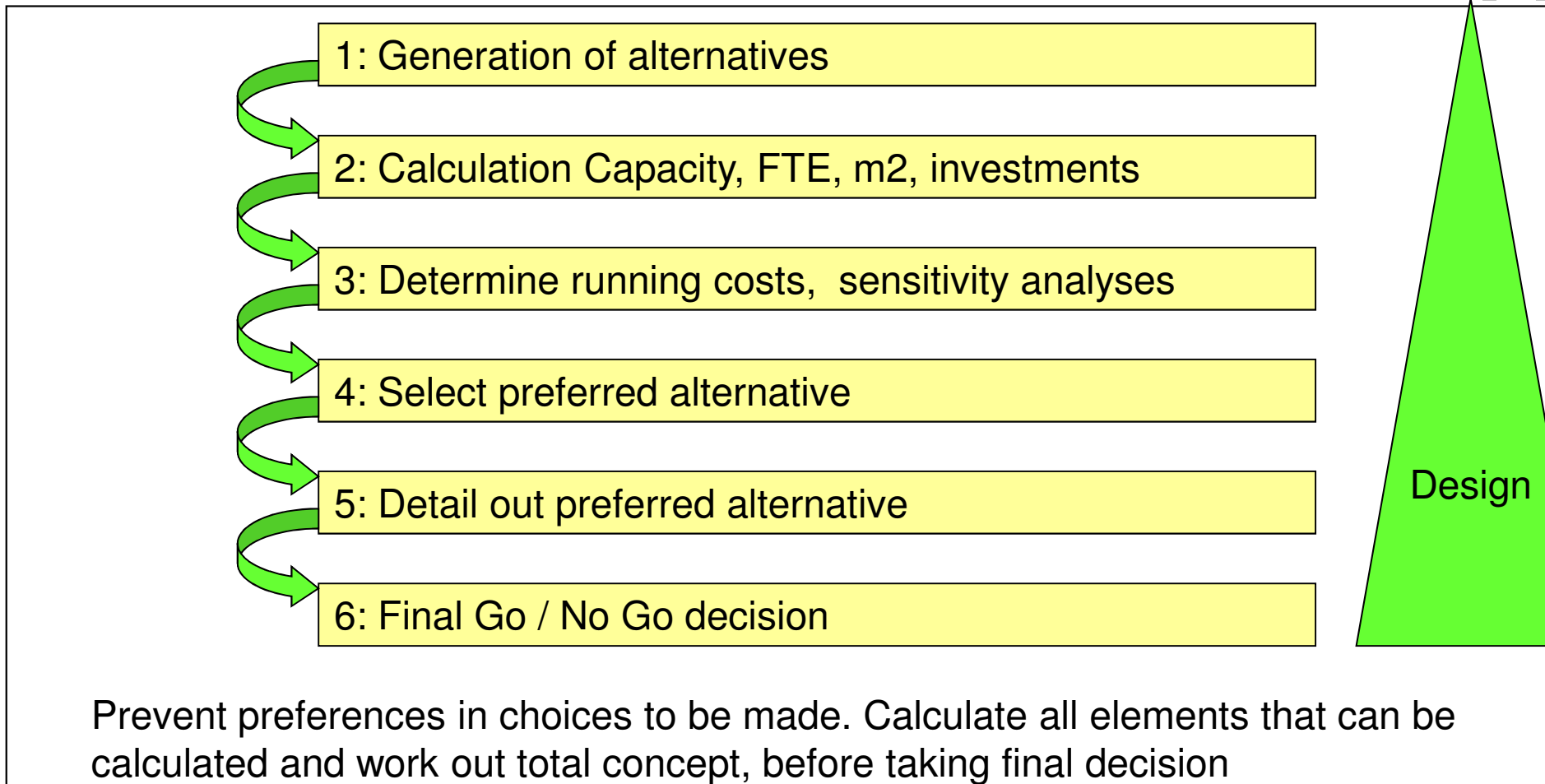
- Products, quantities and processes !



Approach: Analyses



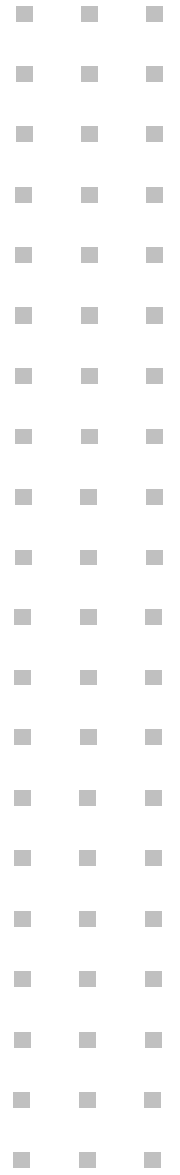
Approval required on basic data and assumptions from all parties involved, before proper design can be made.

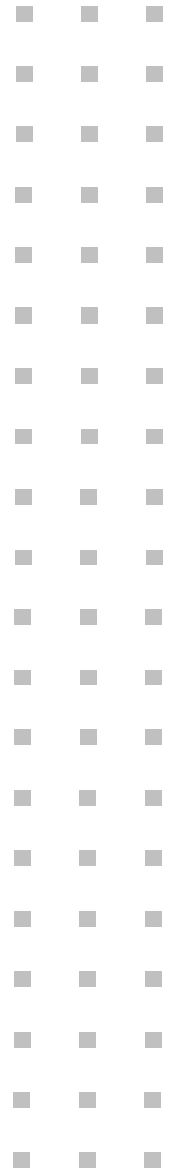


Agenda



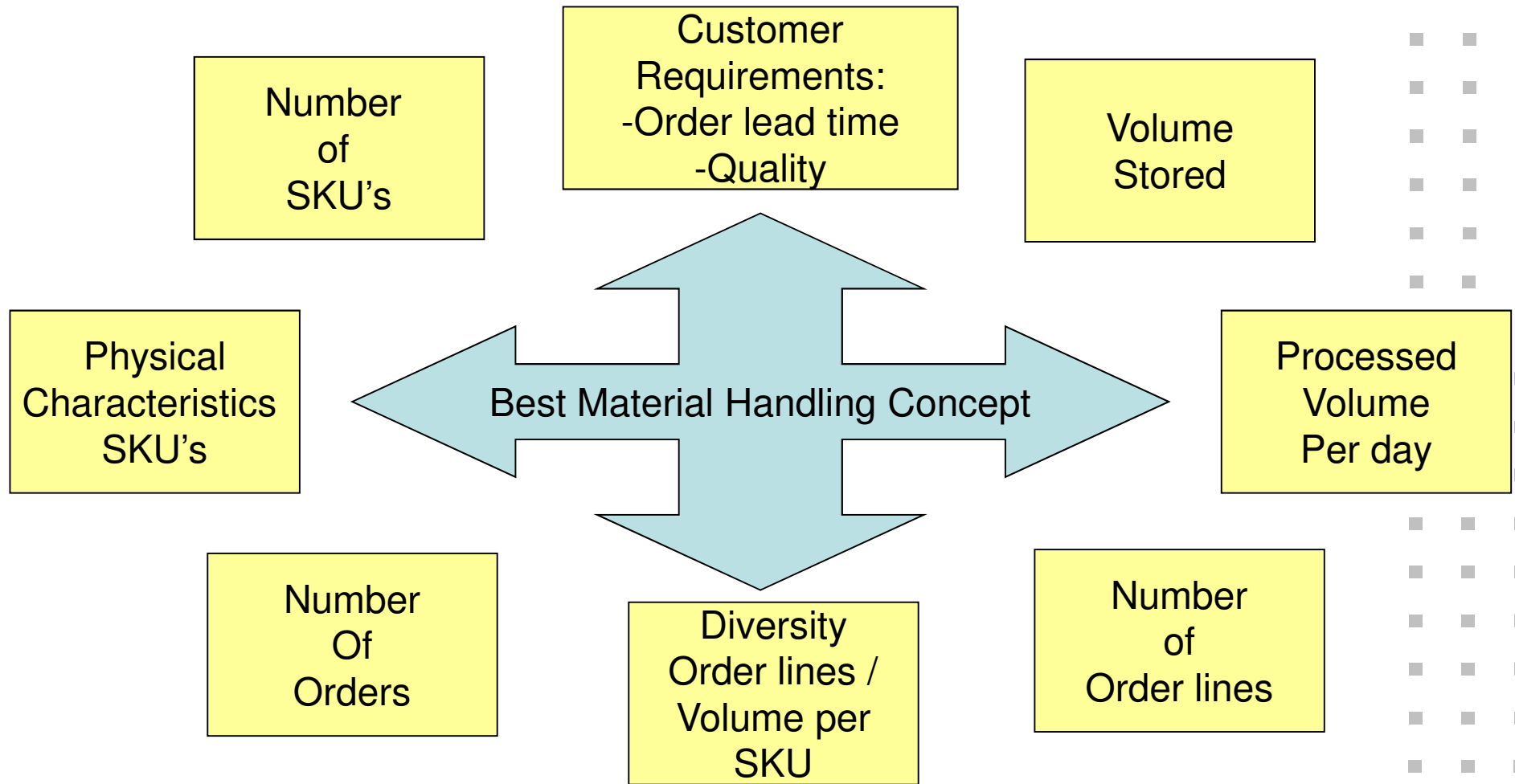
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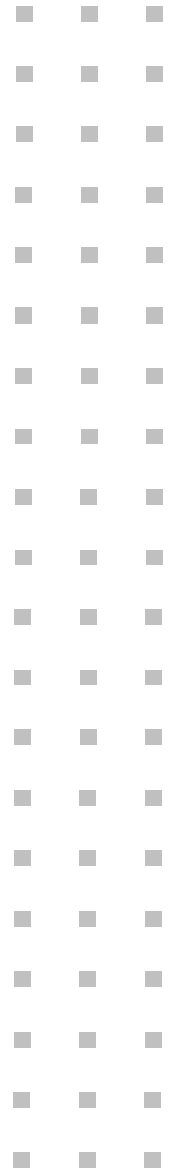


- We have all data we need!
 - Difference between data dump ⇔ proper logistics information
 - Having a data dump is not equal to having the right information
 - Big reports contain a lot of data, but does it help you?
 - Even signed off basic data documents can contain a lot of nonsense
- Which information do you need for a proper warehouse design?
- *Question: which information do you need for a proper warehouse design?*

Basic Data Data Requirements Concept



Basic Data Requirements & Quantification

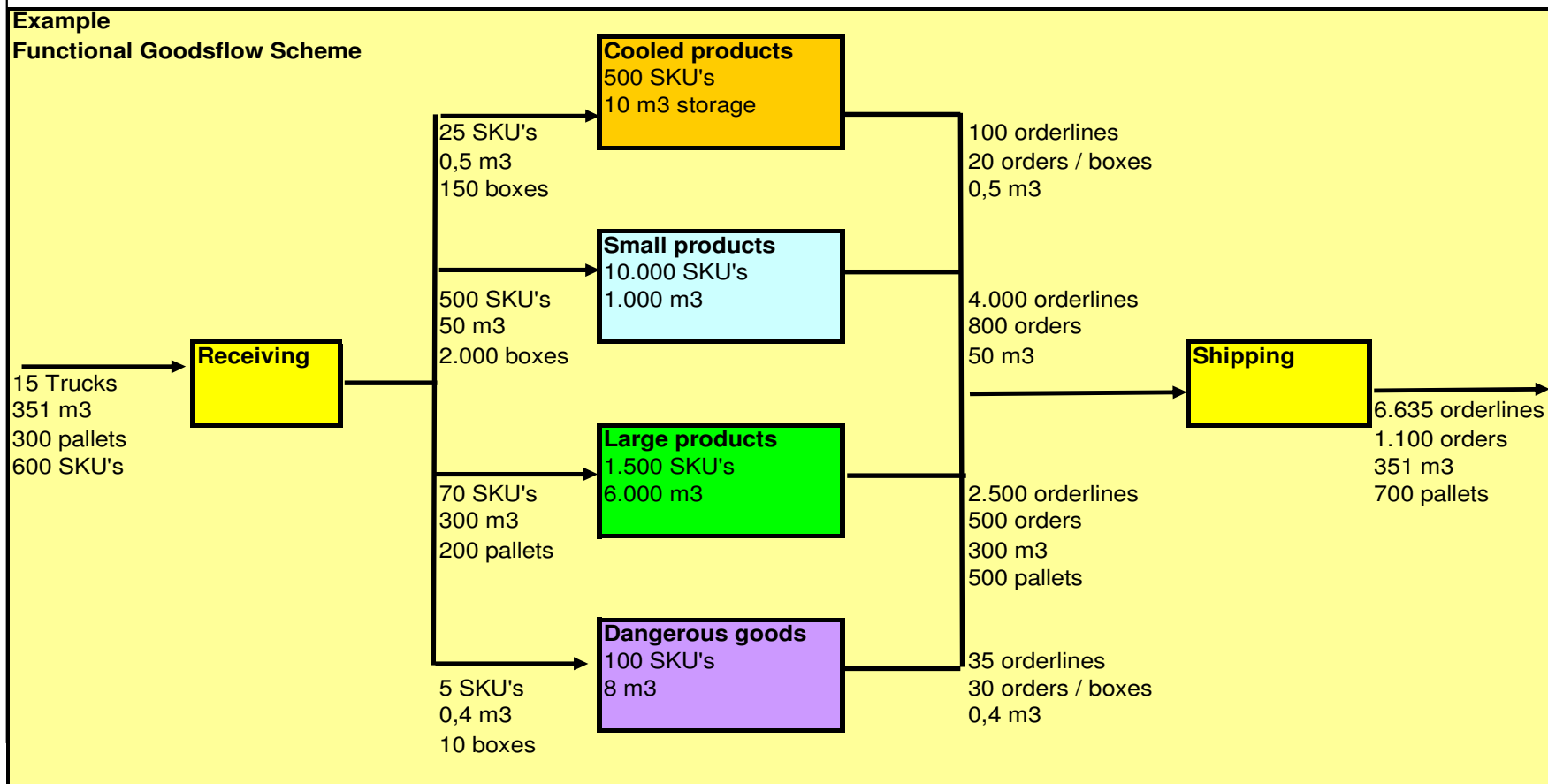


- Assortment analyses based on physical characteristics products
 - Dimensions products
 - Weight
 - Climate conditions
 - Dangerous goods
 - Stacking sequence
 - FiFo, FeFo
 - Other

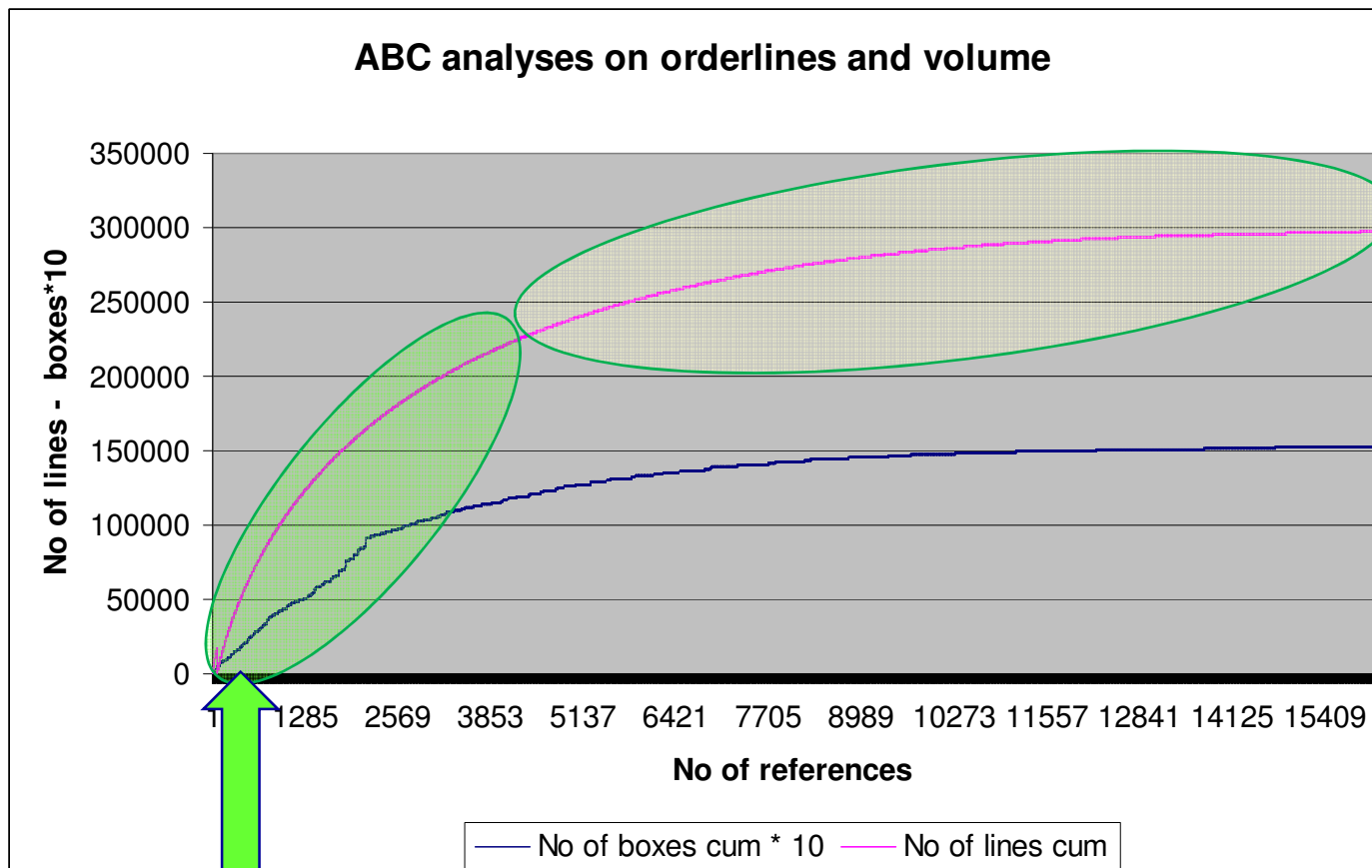
- **Define groups of SKU's with comparable physical characteristics**

- Logistics analyses
 - ABC on outgoing order lines and volume
 - ABC on incoming order lines and volume
 - Order frequency table
 - Stock calculations
 - Turn over ratio stock
 - Correlation between SKU's
 - Seasonality
 - Life cycle

- Functional Goods flow scheme required to “create distance to **how** it works now”



ABC-analyses



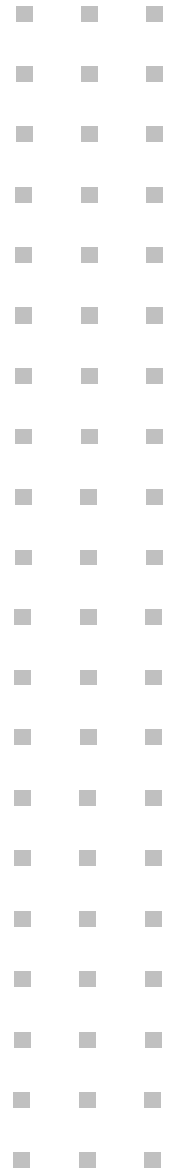
Focus on pick locaties / storage density

Focus on efficiency
Ergonomics picking locaties

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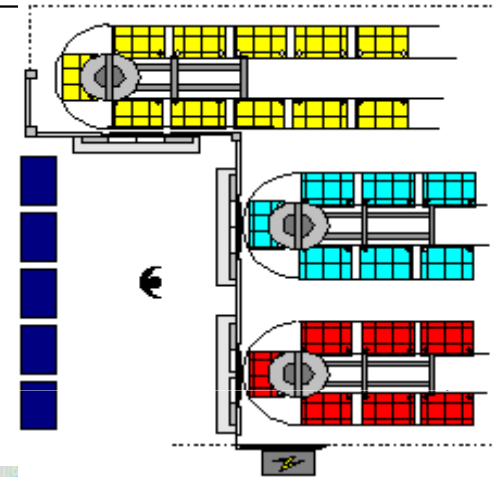
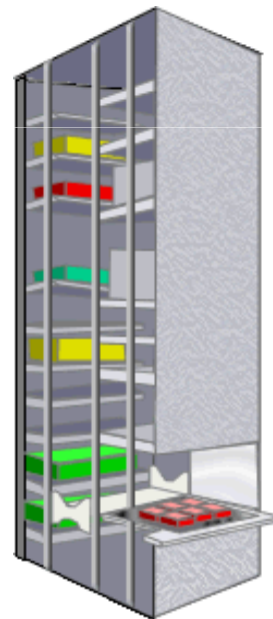
- Mechanical automation and WMS-systems can make you enthusiastic,
- Video
- but:
 - Do you need it?
 - Does it fit to your requirements?
 - The initial investments are known, but do you also know the yearly maintenance costs and costs for daily technical and application support?
 - What are the benefits for your organisation
 - What are the limitations of automation for you and for your customers
 - How flexible is the system for future changes



Techniques

Example small parts storage

- Lifting cabinets Carrousel



Techniques

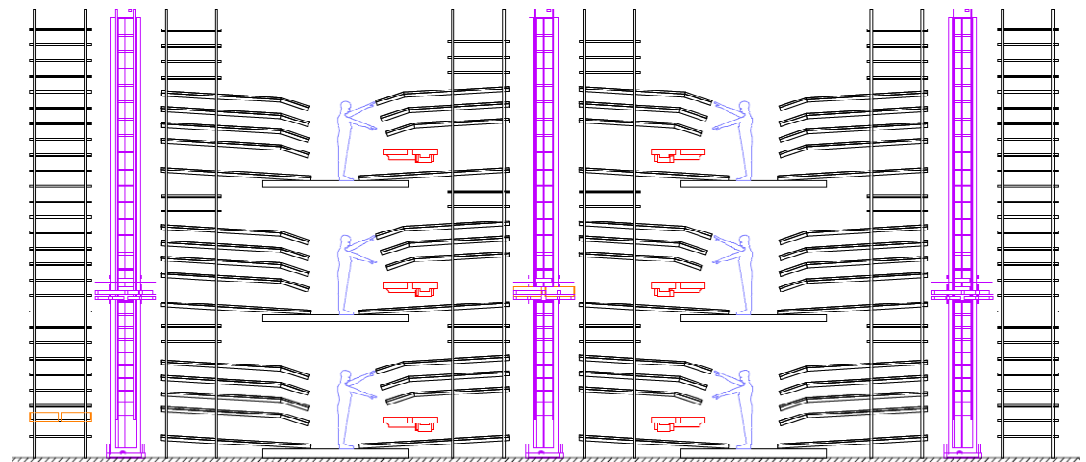
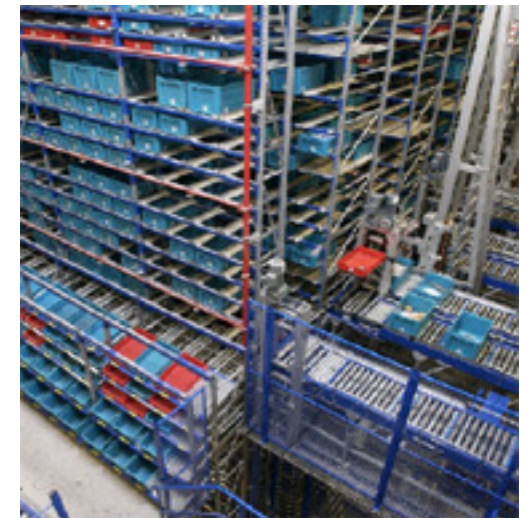
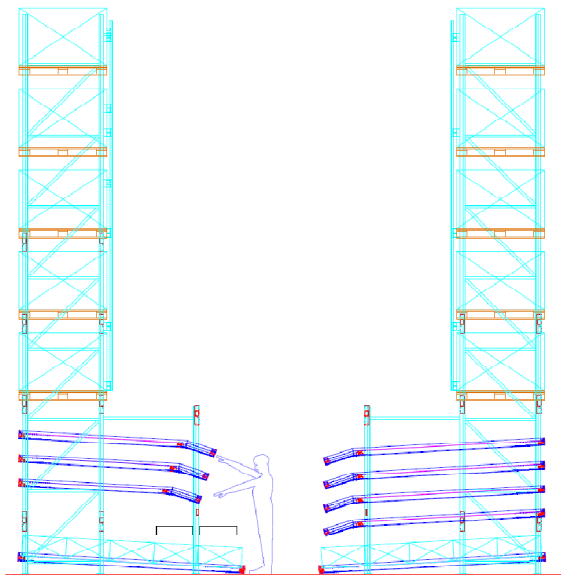
Example small parts storage

- Miniload systems



Techniques

Picking Methods & Techniques, combined



Techniques

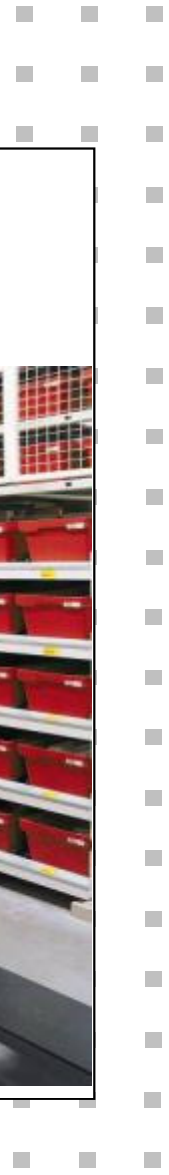
Picking Methods & Technics, Combined

- Pick-to-Bin and Pick-to-Belt systems



Techniques

Picking Methods & Techniques, Combined

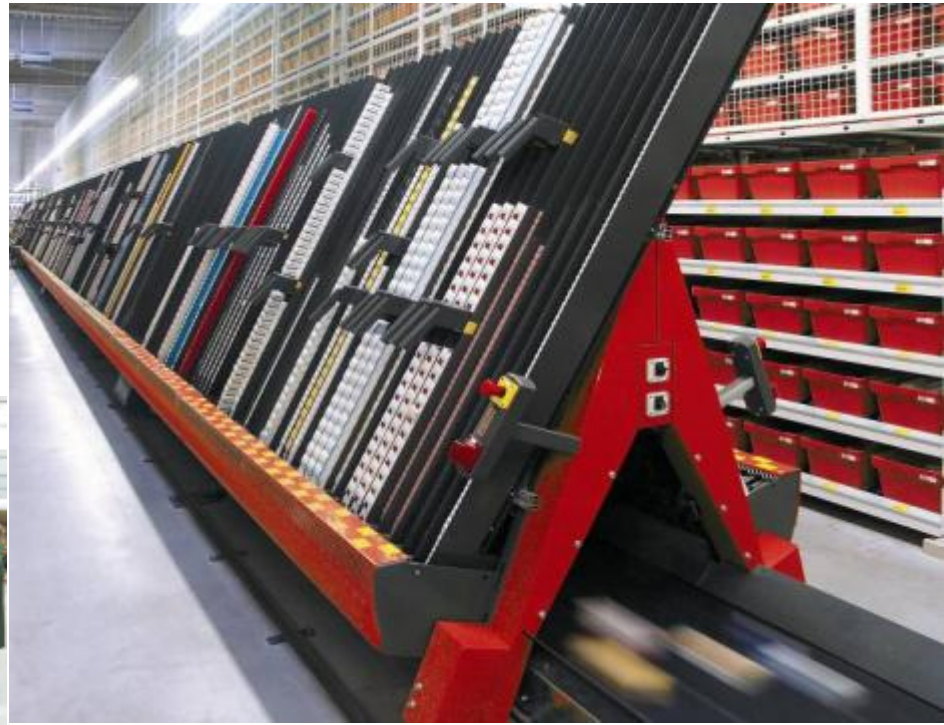


- Dynamic Picking

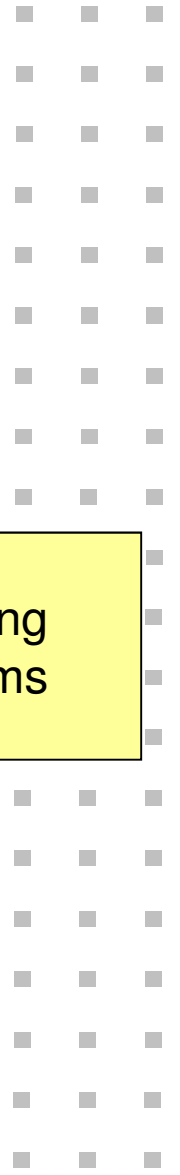
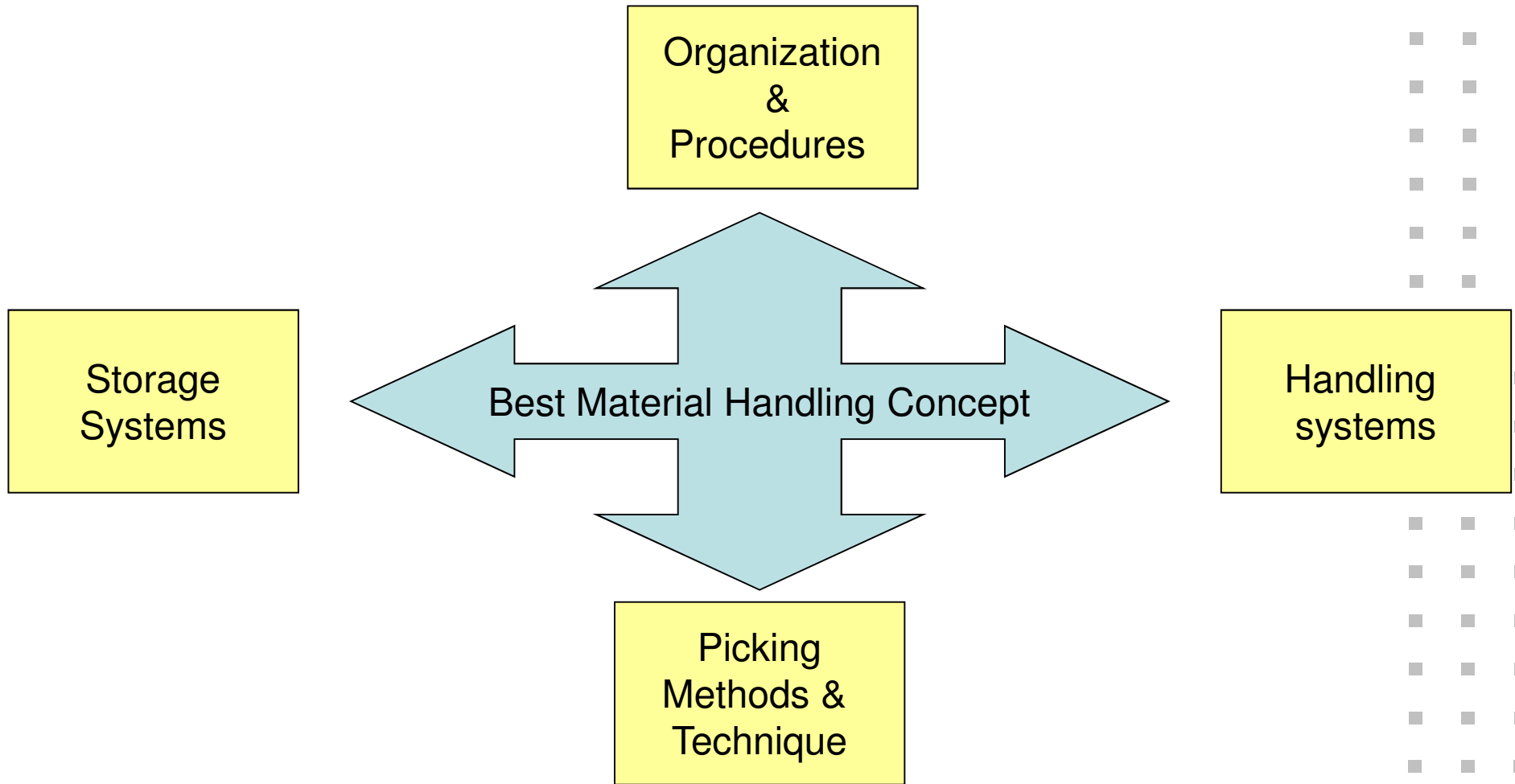
A-frame



K 20

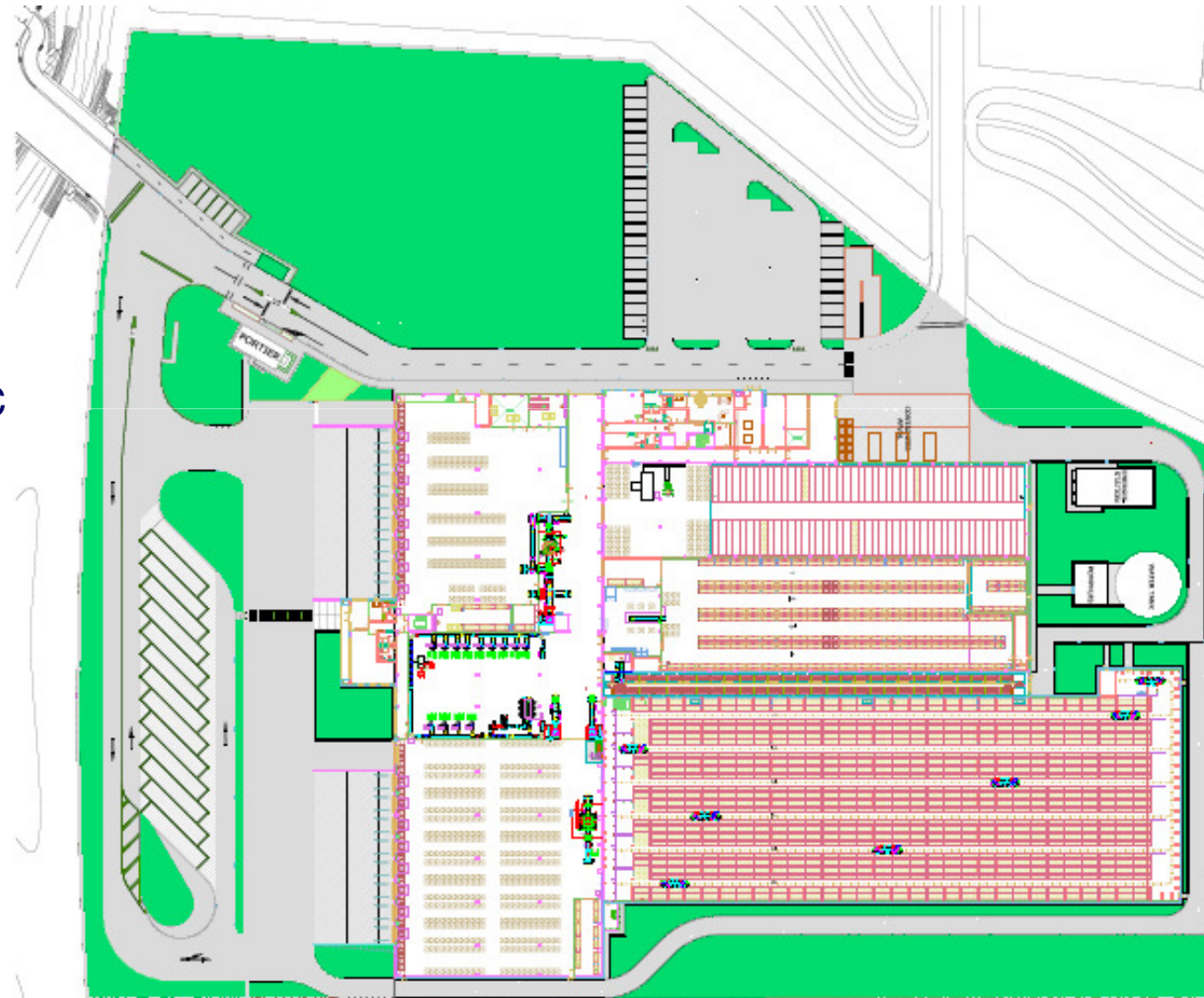


Techniques Design Generation Alternatives



Design total layout

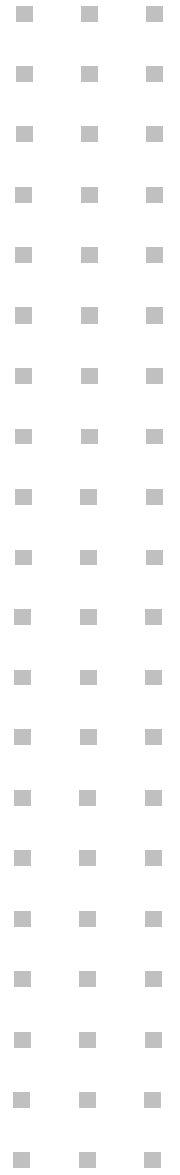
- First:
 - Material Handling concept.
- Second:
 - Translation material handling concept in total DC Lay out



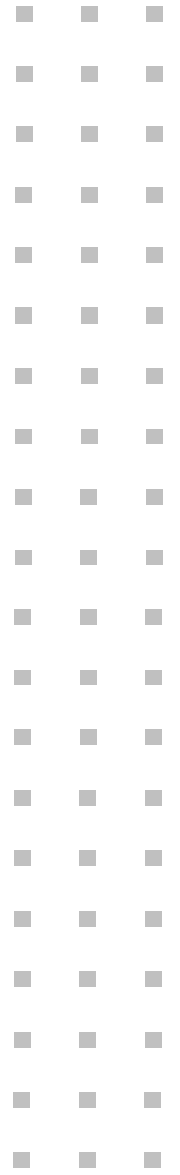
Agenda

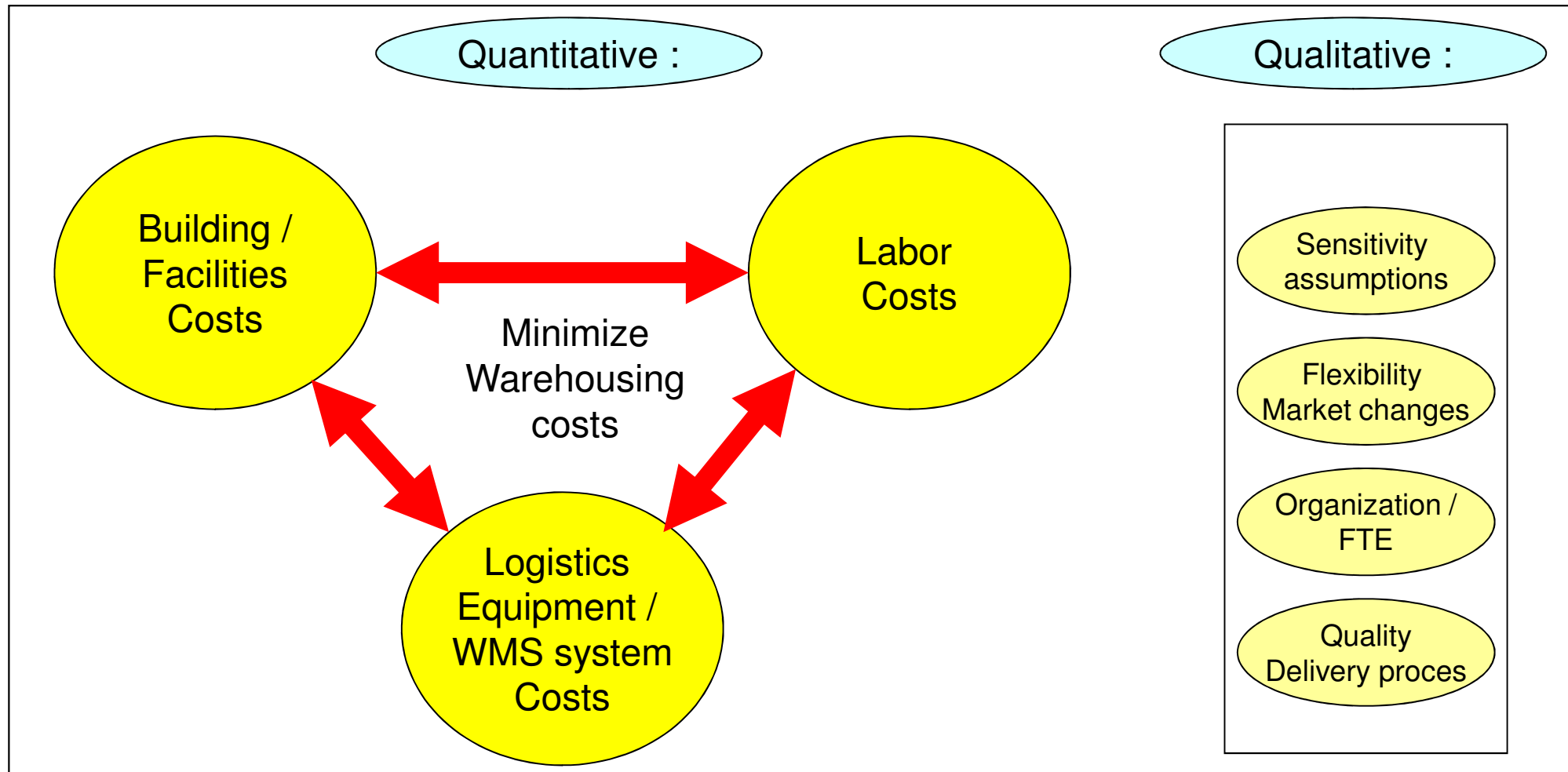


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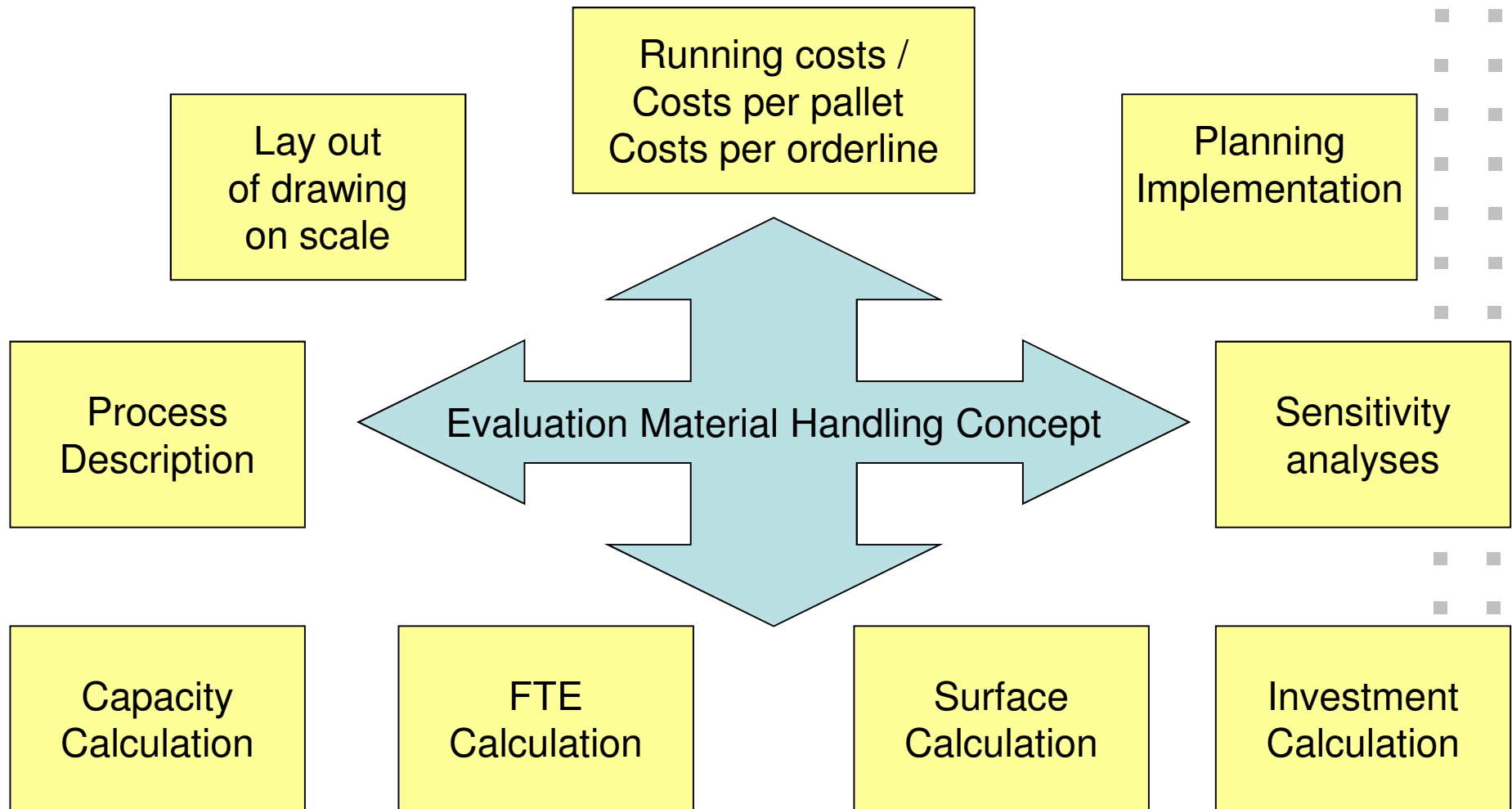


- The preferred solutions should be evaluated, but what are you going to evaluate?
 - Current situation with 1 alternative solution?
 - Several alternative solutions, all worked out to the same level?
 - Current situation: Current model or “optimized current situation”?
- What are you going to evaluate?
 - Current situation or future situation (growth assortment, turnover)?
 - Average volumes and/or peak demands?
- How are you going to evaluate alternative solutions?





Evaluation Alternatives



Evaluation Alternatives

- Quantification

- FTE's
 - Inbound
 - Replenishment
 - Picking
 - Packing / checking
 - Shipping
 - Indirect (maintenance)
- Space / number of m2
- Investments
- Running costs

- Other factors

- Sensitivity analyses
 - SKU's
 - Orders / orderlines
 - Volume
 - Customer requirements
- Flexibility
- Dependency Technical system
- Extendable
- Performance (avg/peak)

Evaluation Alternatives

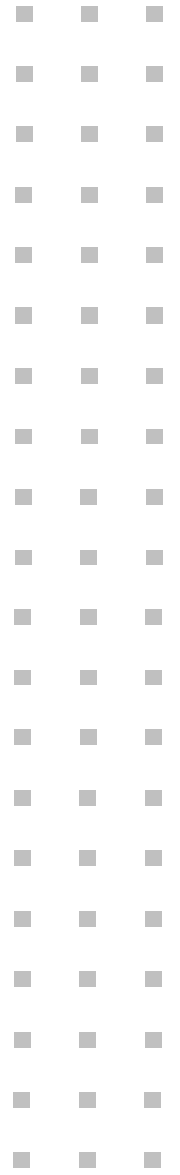
- Prevent:
 - Personal preferences => most important reason for choosing mechanical solutions
 - Open Ends
 - Optimistic calculations
 - Scope limitations; overall solution
 - Too optimistic Basic data

- How:
 - Lay-out drawings on scale
 - Process description, explaining total process
 - Implementation planning
 - Reference visits comparable environments
 - Involve Operations, Maintenance and IT
 - Calculate Learning curve

Agenda



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Organization & procedures

Market requirements ↔ Internal optimization

Market Requirements:

- Order lead time
 - Same day
 - Next day
- Internal / external Cust.
- Quality
- Standardization
- Value Added Services
- Power in Supply Chain (Suppliers/customers)

Organization:

- Scheduling
 - Receiving
 - Picking / packing
- Optimization
 - Workload control
 - Balancing process
- Impact Distribution
 - Via Hub
 - Dedicated

Optimization:

- Order picking
 - Pick per order
 - Batch picking
- Picking/checking
 - Integrated
 - Separate
- Double play's
 - Inboud
 - Outbound

Storage systems

Single deep / multi deep ↔ Moving / non-moving

Small items:

- Shelves
 - Single level
 - Multi level
- Case flow racks
- Miniload system
- Lifting cabinets
- Carroussel
- Pater Noster
- Moving cabinets

Pallet items:

- Pallet racks
 - Wide aisle
 - Small aisle
- Cranes
- Shuttles
- Block stack
- Pallet flow racks
- Drive in racks
- Moving cabinets

Long items:

- Block stack
 - Loose
 - Supported
- Cantilever
 - Manual
 - Automated
- Pigeon hole
- Vertical

Handling systems

Fixed / Non Fixed ↔ Manual / Automated

Trucks:

- EPT
 - Single pallet
 - Multiple p.
- Forklift truck
 - Single pall.
 - Multiple p.
- Reach truck
- Narrow aisle
- Heavy load trucks
- AGV's (automated)

Cranes / elev.

- Miniload cranes
 - Single
 - Multiple
- Pallet cranes
- Shuttle systems:
 - High speed
 - Low speed
- Overhead cranes
 - Length
 - Wide

Conveyor:

- Bin conveyor:
 - Roller
 - Belt
 - Sorters
- Pallet conveyor
- Shuttle systems
- Mono rail system

Picking Methods & Technique

Goods-to-Man:

- Orderpicker fixed
 - Pallet cranes
 - Miniload system
- Optimal design w.p.
 - Information control
 - Picking/checking
- Typical
 - Slow movers
 - Heavy/dangerous

Man-to-Goods:

- Orderpicker to goods
 - Pick car / rol cage
 - Electrical Pallet tr.
 - Lifting pallet truck
- Flexible workplace
 - Information
 - Load carrier
- Typical:
 - Most used system

Combined:

- Orderpicker semi-fixed
 - Pick-to-bin
 - Pick-to-belt / sorter
- Transport picked goods
 - Automated
 - Save walking
- Typical
 - Large volumes
 - Large no of lines