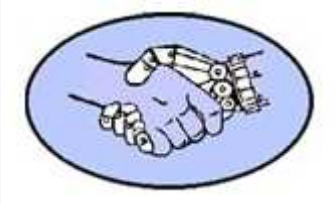
INESCPORTO
INSTITUTO DE ENGENHARIA DE SISTEMAS
E COMPUTADORES DO PORTO
LABORATÓRIO ASSOCIADO

Campus da FEUP
Rua Dr. Roberto Frias, 378
4200 - 465 Porto
Portugal

T +351 222 094 000
F +351 222 094 050

www@inescporto.pt
www.inescporto.pt



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LEAN MANUFACTURING FOR SHORT COMPLEX PRODUCT LIFE-CYCLE ENVIRONMENTS

JOSÉ CARLOS CALDEIRA

DIRECTOR

(jcc@inescporto.pt)

Presentation Structure

- Context
- The impact and the challenges
- Some concepts
- Examples
- Conclusions

Advantages and requirements of LEAN (some)

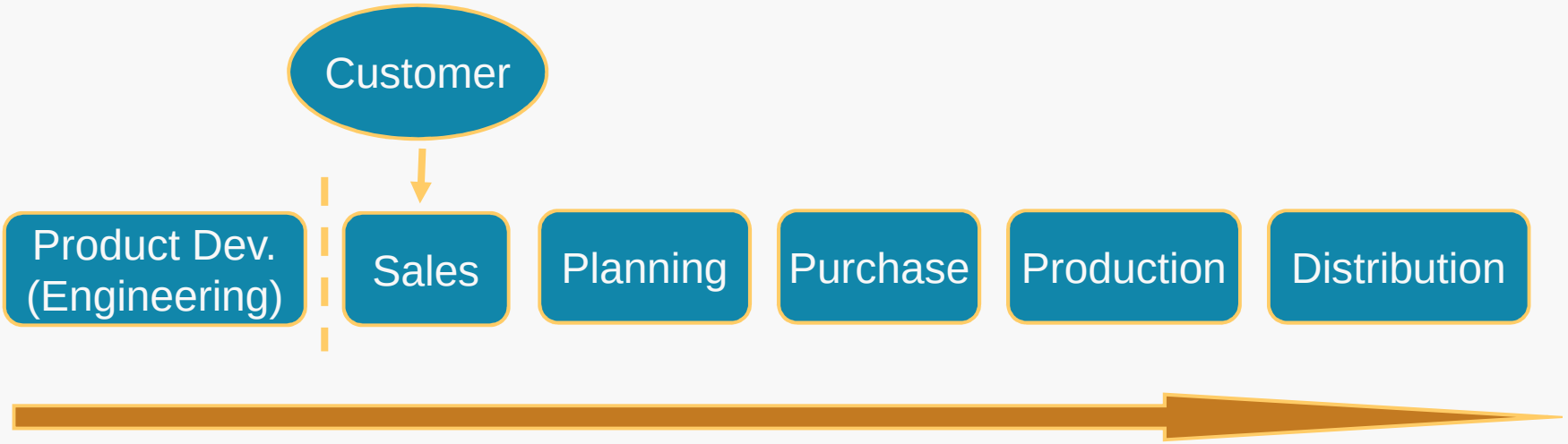
- Minimize stocks
- Minimize handling
- Fast throughput time
- Easier planning, monitoring and control
- High efficiency
- ....
- Model stability
- Production stability
- Continuous improvement
- .....

Context of customised products

LEVEL OF CUSTOMIZATION	CUSTOMER INTEGRATION	ENGINEERING PROCESS
Parameterization (cars)	Selects from pre-defined list of options	Pre-sales engineering
Best fit (clothes)	Customer data is used to select the best "size" from existing list	Pre-sales engineering
Custom made (special cutting tools)	Customer data is used to develop a unique product	Pre-sales and pos-sales engineering

Impact of “Custom Made”

Make-to-Order process of pre-defined products (simplified)



- Response time doesn’t includes engineering activities
- Some pre-sales purchasing and production activities are possible
- Customer orders can be grouped in production orders

Impact of “Custom Made”

Make-to-Order process of custom made products (simplified)

- Customer order includes specific product/customer data
- Response time includes engineering activities
- Purchased products may depend of engineering activities
- Each customer order is a **unique** production order (CAD/CAM/CNC, etc.)
- Etc.

Impact of “Custom Made”

Major transfomation in almost all processes

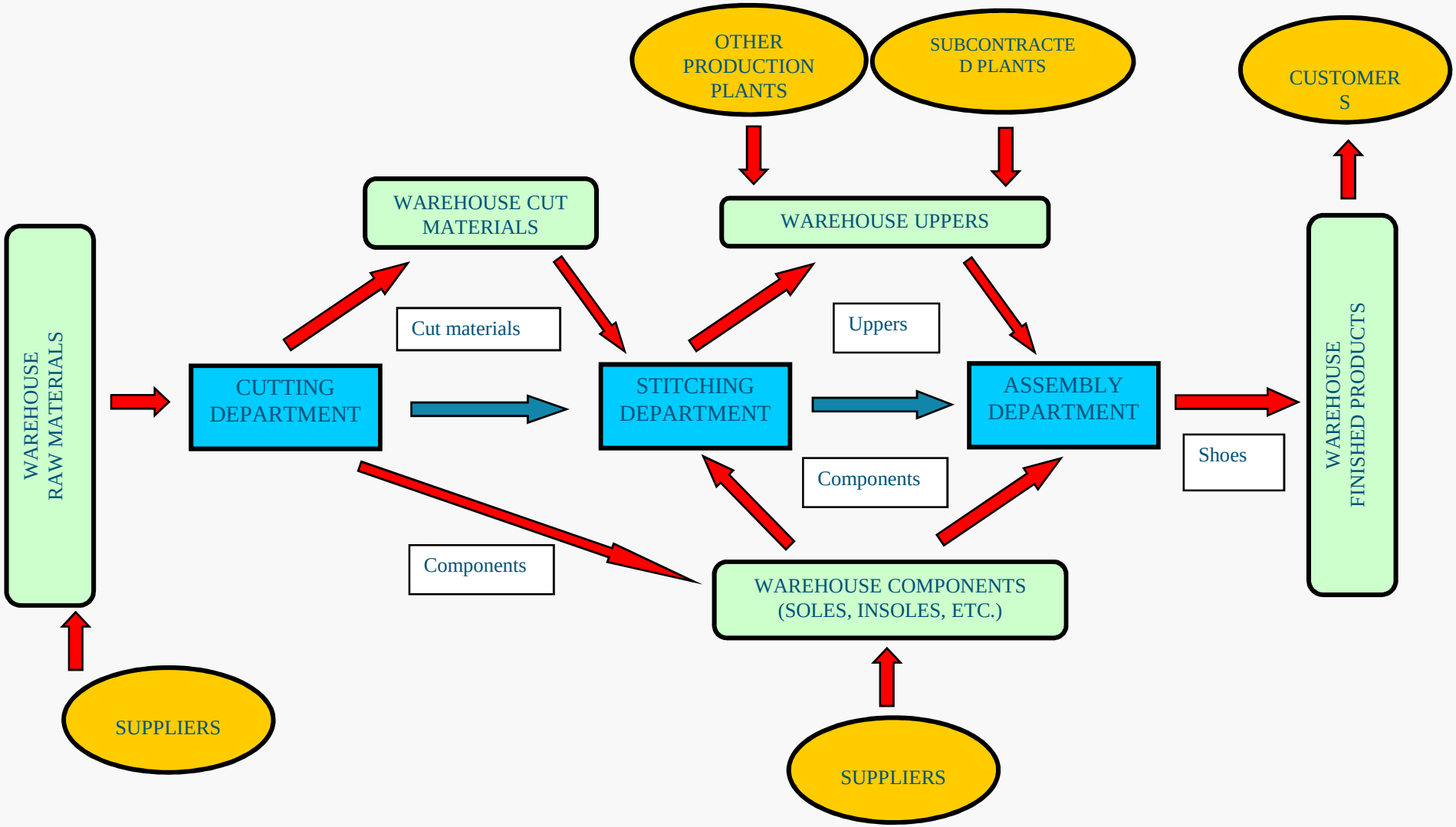
- Sales become more complex (from catalog to product or customer specification)
- Engineering may become a bottleneck (is part of response time)
- Purchase of materials and components may also require unique specifications
- Big pressure in terms of production planning and control (minimization of set-up, shorter cycle times, etc.)
- Huge complexity increase in terms of internal and external logistics
- Etc.

Challenges of “Custom Made”

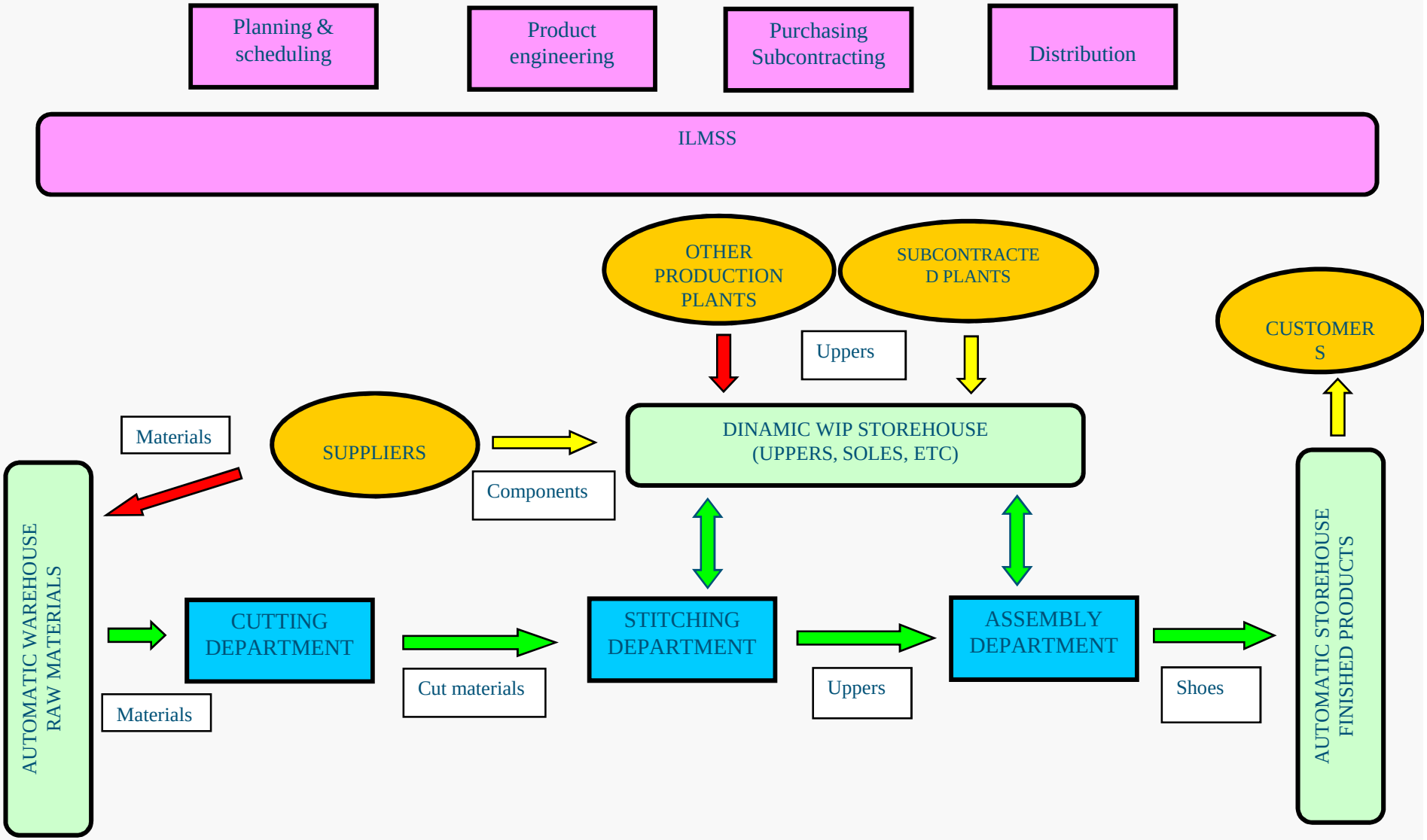
IN THIS CONTEXT, WHAT DOES IT MEAN “LEAN”

- Stock minimization: results from the combination of unique products and fast response time
- Handling minimization: materials flow simplification and automation
- Throughput time: process integration (from customer to suppliers); information flow automation
- Planning and logistics: more complex (no miracles); integrated management of materials and information flows
- High efficiency: simplification and automation; emulate LEAN concepts in this (very) different environment

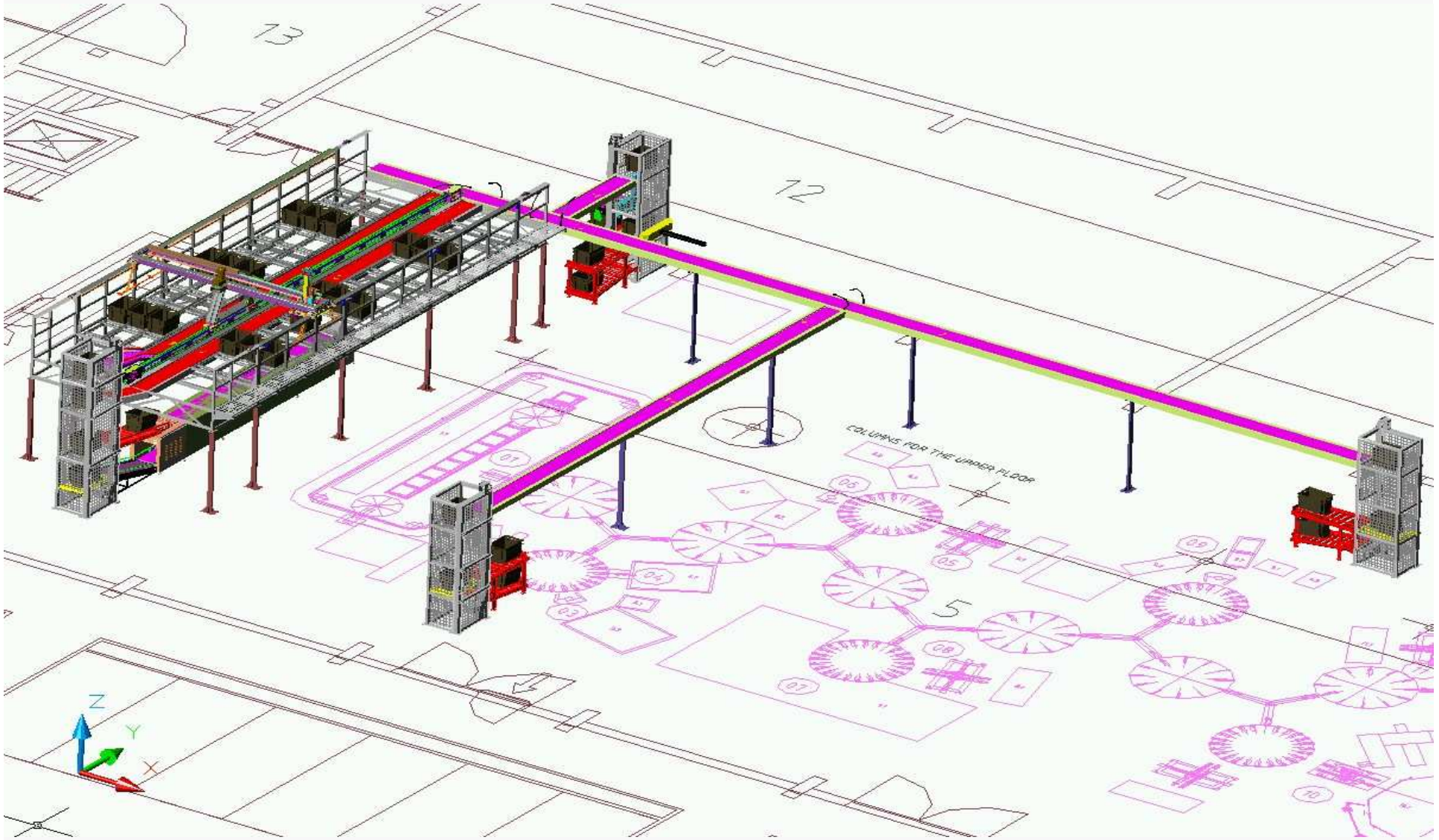
Concepts for Custom Made – Internal Logistics



Concepts for Custom Made – Internal Logistics



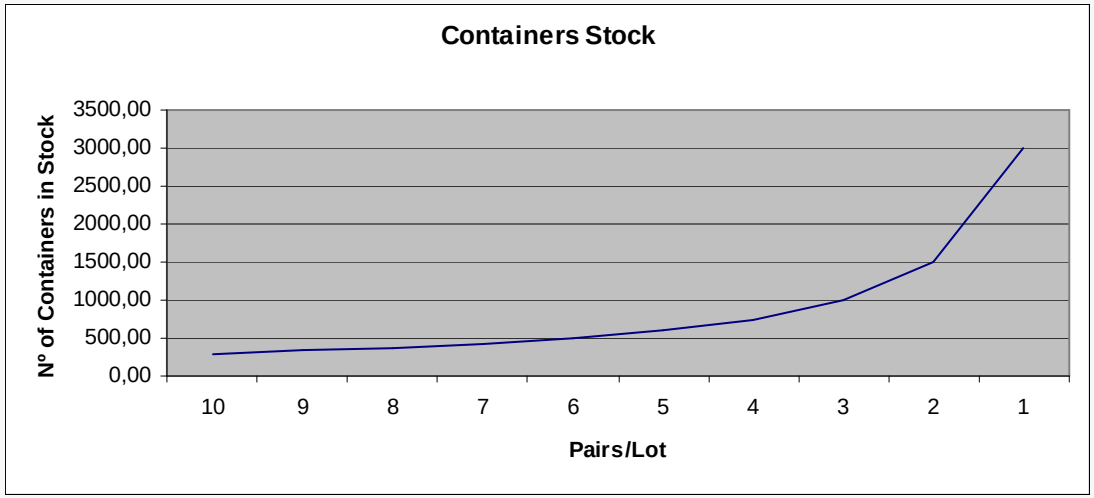
Concepts for Custom Made – Internal Logistics



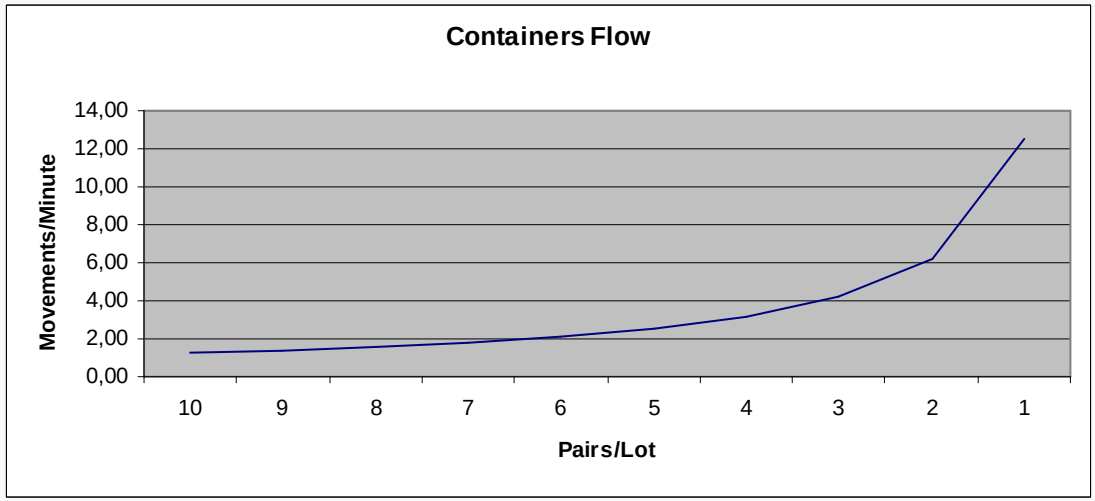
Concepts for Custom Made – Internal Logistics

Concepts for Custom Made – Internal Logistics

Simulation for 1000 pairs

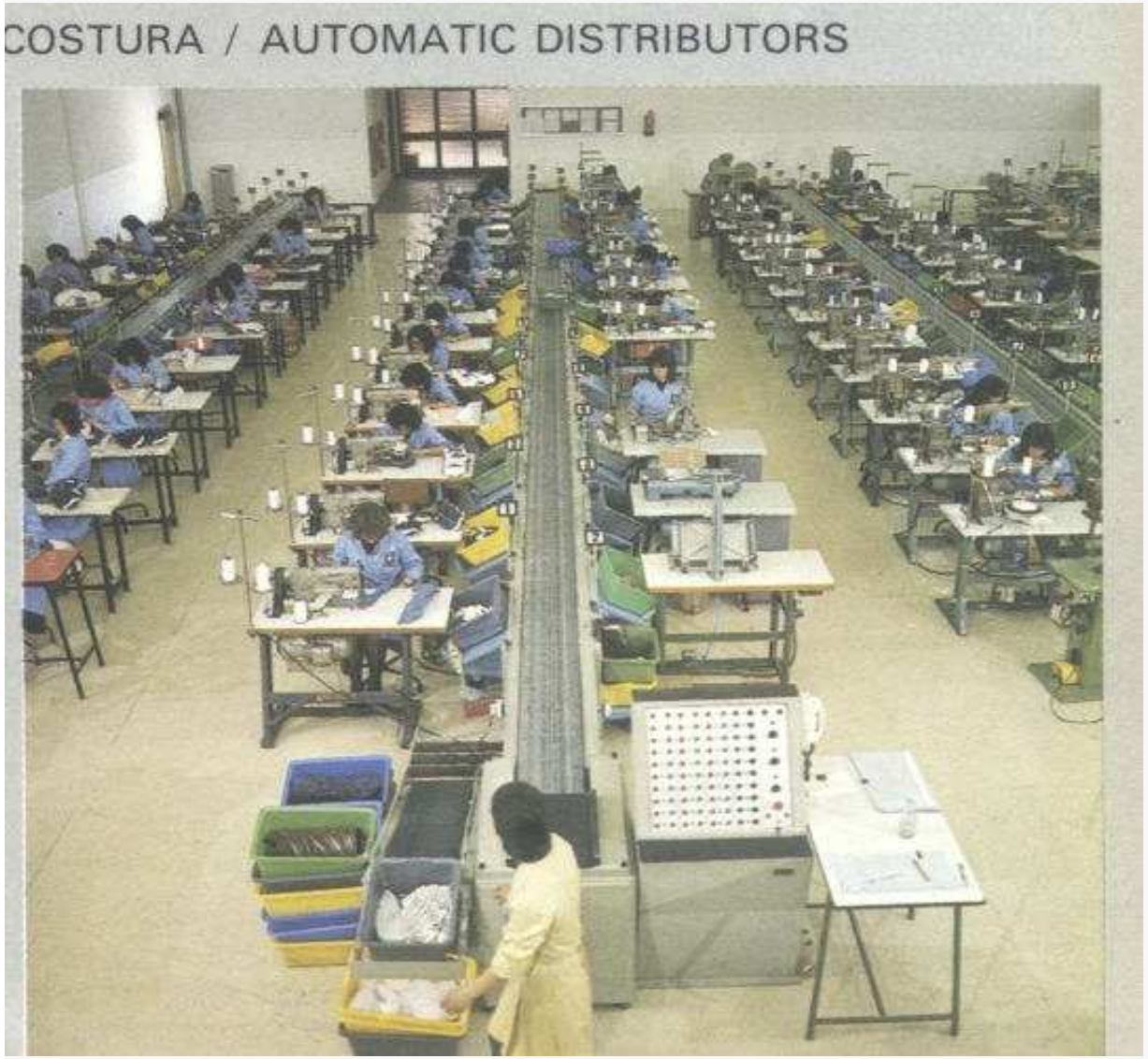


Summary		
Pairs/Lot	**Mov/Minu**	**Stock**
10	1,25	300
5	2,50	600
1	12,50	3000



Summary	
Pairs/Lot	**Mov/Minu**
10	1,67
5	3,33
1	16,67

Concepts for Custom Made – Production



Stitching Department (70's)

Concepts for Custom Made – Production

Stitching Department (80's)

Concepts for Custom Made – Production

Stitching Department (90's)

- Full automatic storage and distribution system
- Intelligent balancing and scheduling system
- Full production management system
- Some posts feed cells

Concepts for Custom Made – Production

Results

- From orders of thousands of units to few units
- From few models to hundreds of different models
- From large batches/lots of few models in production to hundreds of lots of many different models, each with few units
- From response time of months to days
- From mass production and cost competition to customized production and service level competition (without forgetting cost)

Conclusions

- Aiming at higher added value products and services, several companies are moving towards customization.
- This brings new challenges and needs in allmost all company's business processes.
- Conventional organizational models, systems and technologies have limitations to deal with these requirements
- LEAN concepts can help the design and implementation of new business models and systems
- In some areas, they need to be "translated" to this specific context

THANK YOU FOR YOUR ATTENTION