# .. Lean …en klassiker

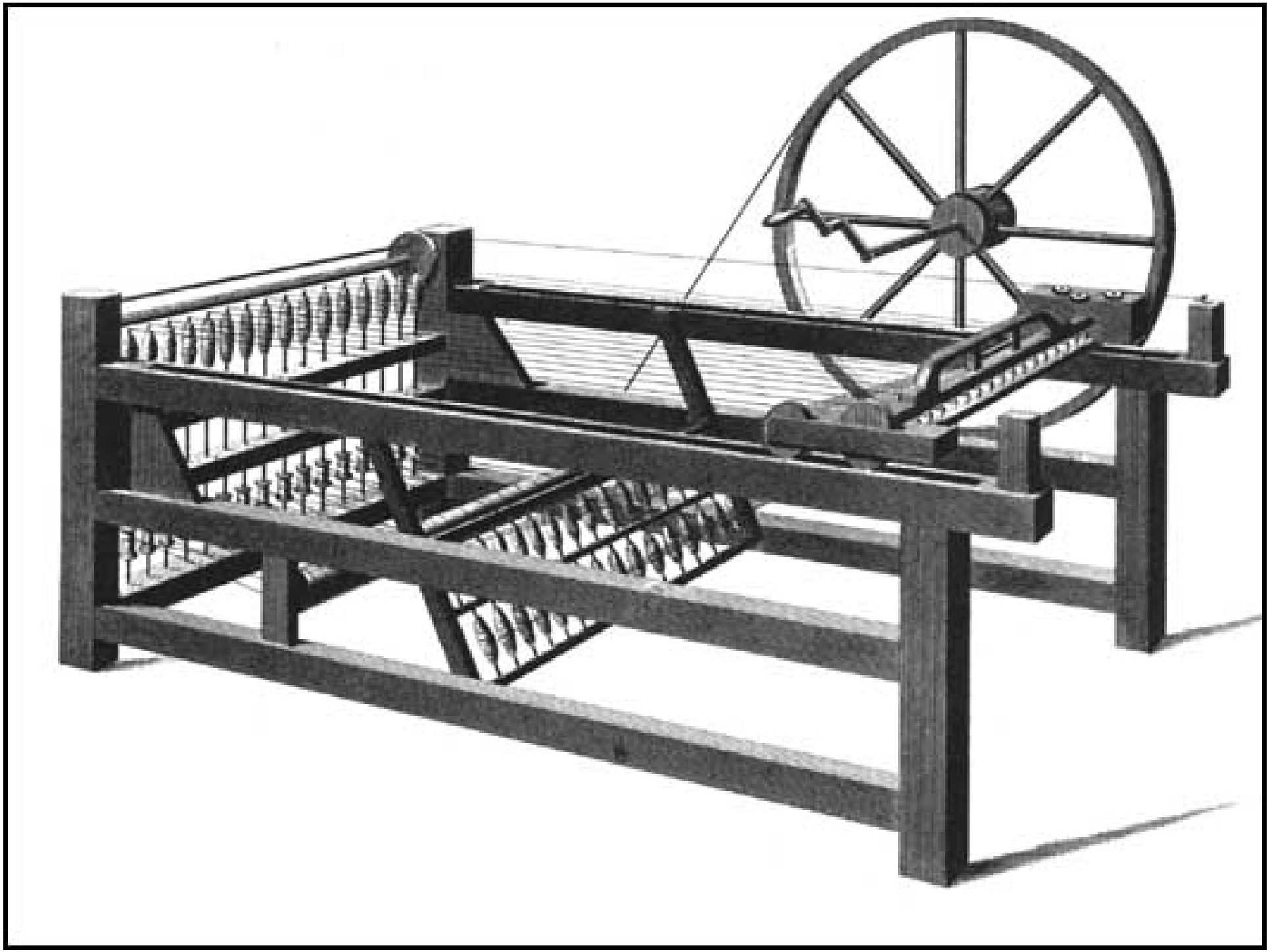
Daryl Powell
Ola Strandhagen

NTNU/SINTEF

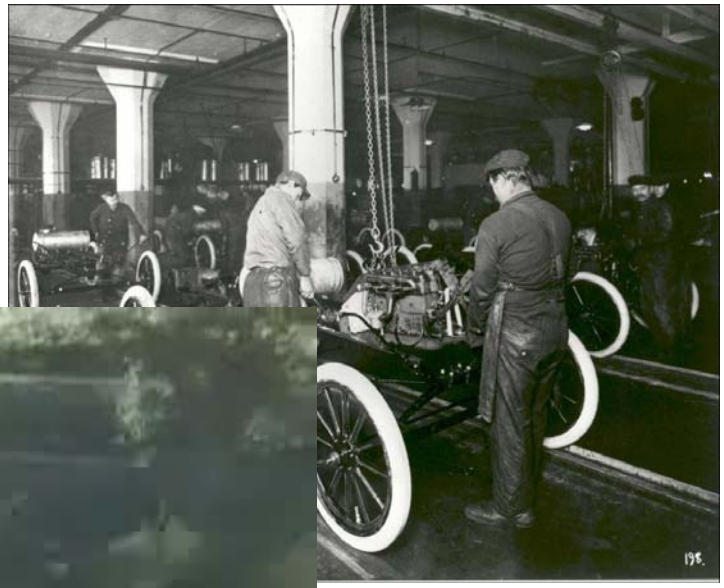
Oslo 3. juni

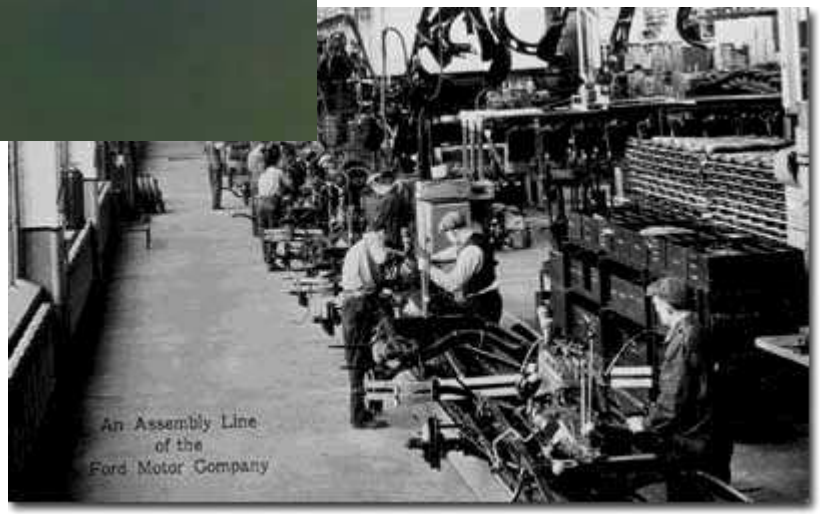
www.smartlog.no


(c) Norsk Hydro

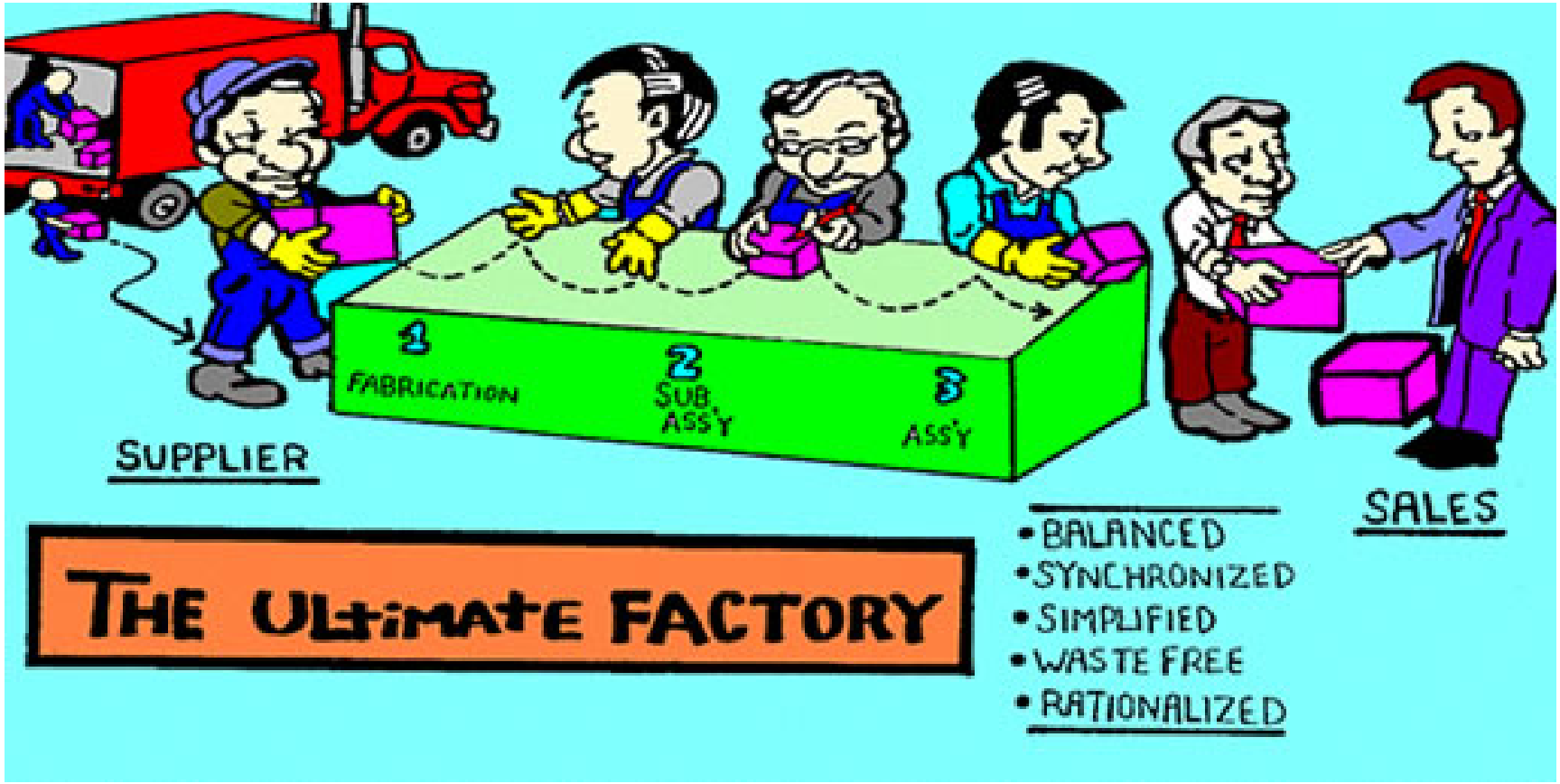


...spesialisering....




An Assembly Line
of the
Ford Motor Company

TOYOTA


1
FABRICATION
2
SUB ASS'Y
3
ASS'Y
SUPPLIER
SALES
THE Ultimate FACTORY
• BALANCED
• SYNCHRONIZED
• SIMPLIFIED
• WASTE FREE
• RATIONALIZED

# ..og med norsk suksess


**1976: Multicolor**, verdens første elektronisk styrte fargeblandingsmaskin lansert på det norske markedet.


PROFILLAGER
M25
M25 - 3
M25 - 4
M25 - 5
M25 - 6
M25 - 7
M25 - 8


SUPPLIER AWARD
FOR ACHIEVEMENT
IN
Quality
2003
Awarded to
Hydro Automotive
Structures Raufoss AS
TOYOTA MOTOR ENGINEERING AND

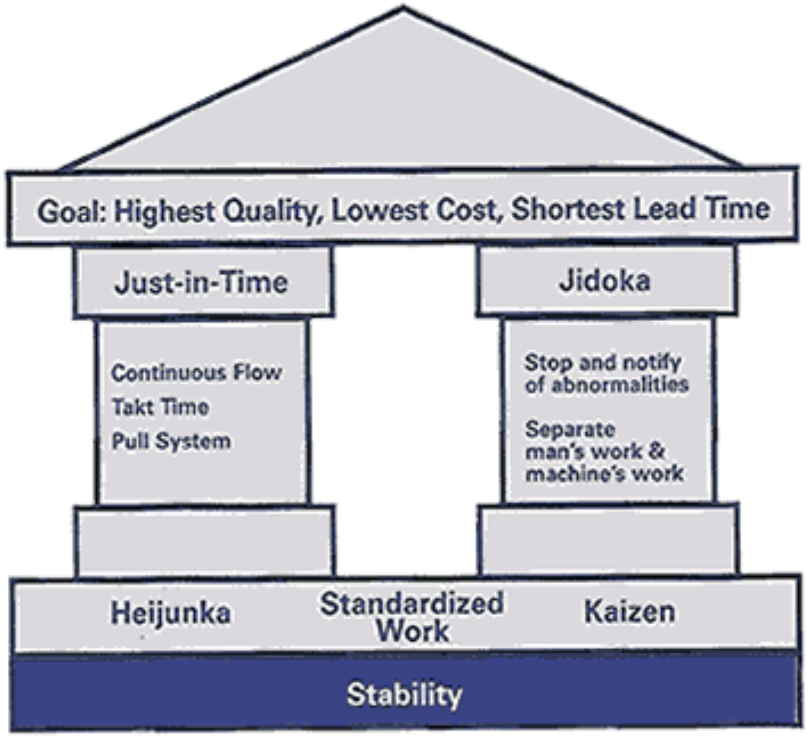
# EUs 7 rammeprogram for forskning

## 4.3.1-1 Beyond Lean Manufacturing – New Industrial Models for Product and Process Life Cycle

**Technical content / scope:** The main objective is to develop a new European production model (paradigm), which ***takes the Lean Manufacturing paradigm further by adding the relevant parts from the European manufacturing culture, standards and technology.*** This production model should provide an integrated approach to combining enterprise management systems with the enterprise technology base, applying human resources and technological factors for optimal leanness and agility, allowing the company to change its strategic and technical focus quickly in response to market trends and demands and to develop distinct core competencies. Among key development issues are: tool and methodological support for the integration of state-of-the-art industrial paradigms for manufacturing fitness, balancing reactivity and efficiency; tool and methodological support for integrating systems and processes of suppliers and customers capable of

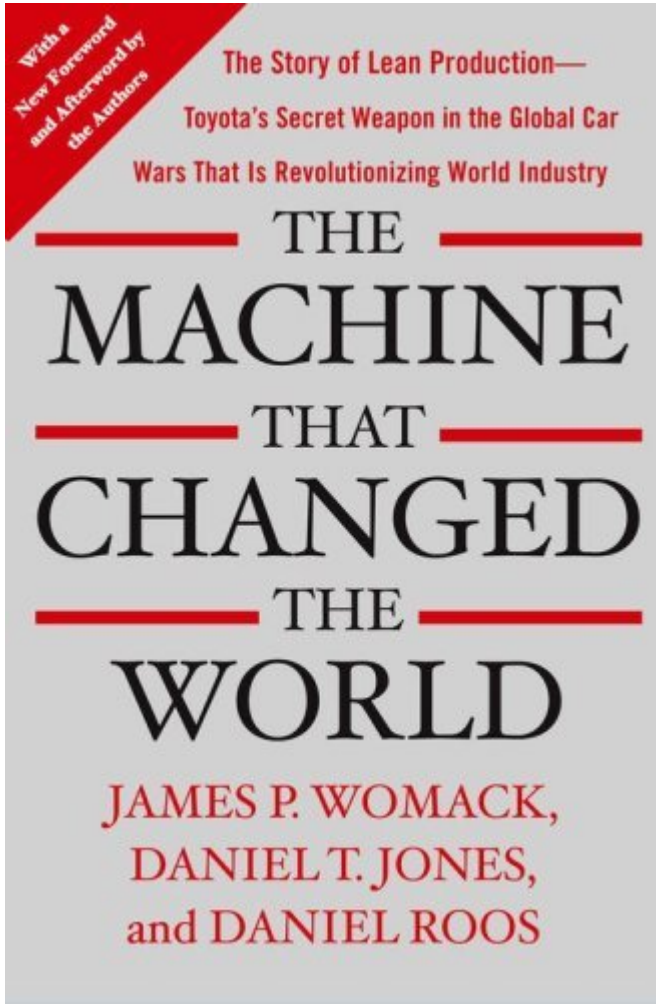
NTNU SINTEF

# Lean Production



# Swansea (Sveins Øy)

# The Machine That Changed The World
## (Womack, Jones & Roos, 1990)




- *The book that changed the world!*
- *Contrasts the lean production of the Toyota Production System (TPS) with the mass production environments of the western world*

# What is Lean Production?

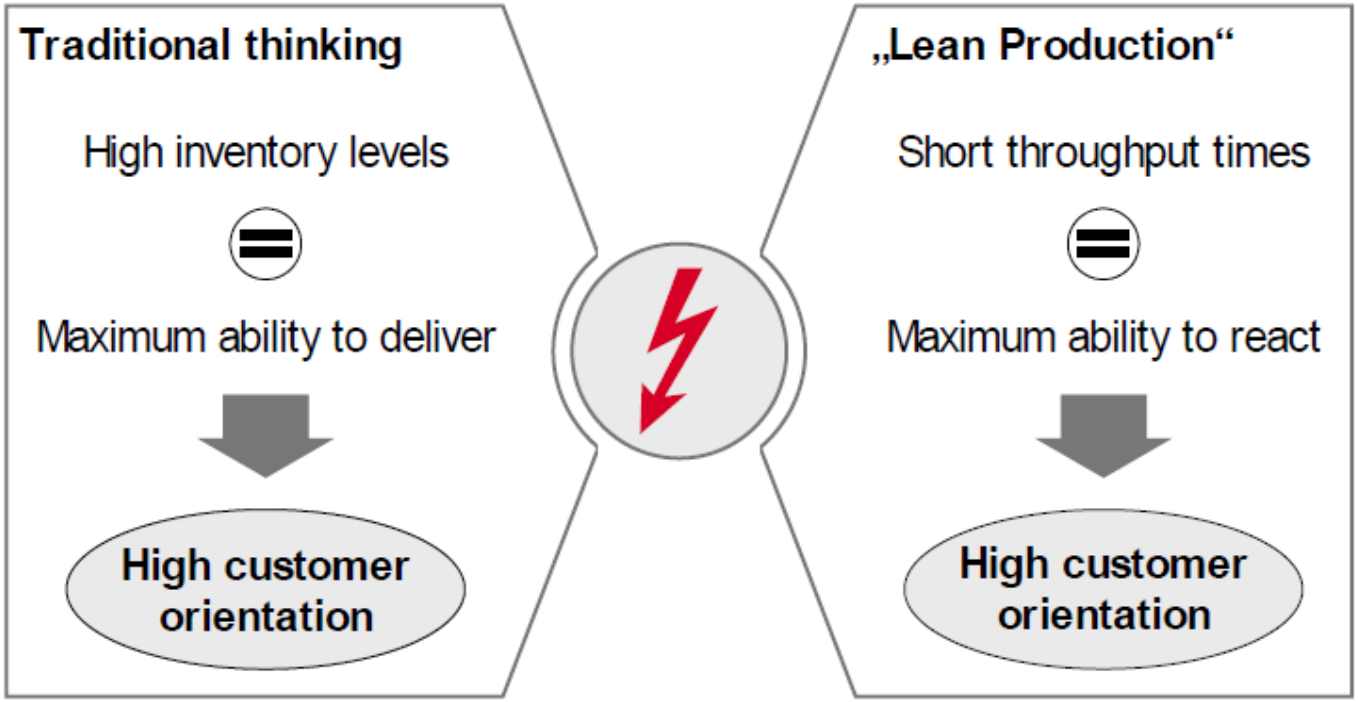
- Doing more & more with less & less…
- The relentless pursuit of waste…
- Common-sense production?
- An unflexible system of highly flexible processes…

- **Lean is the Synchronised Flow of Value Creation…**

# The Key Concepts of Lean Production

- Primary focus: The elimination of waste (customer-centric)
- Goal: To produce the highest quality product at the most competitive cost in the shortest possible time
- Guiding philosophy: Quality should be built into products and processes
- Approach: To create simple, repeatable, standardised tasks
- *The objective is to make money!* (Hopp and Spearman, 2004)

# Lean Thinking:

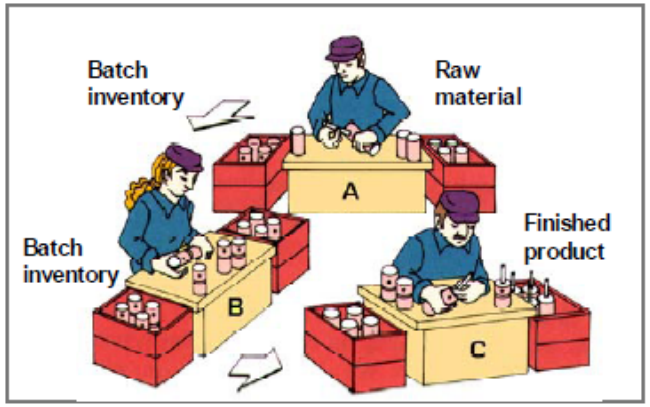



**Effectiveness, NOT Efficiency. (We'll always have customers if we Are EFFECTIVE, However Efficiency DOES NOT guarantee customers).**

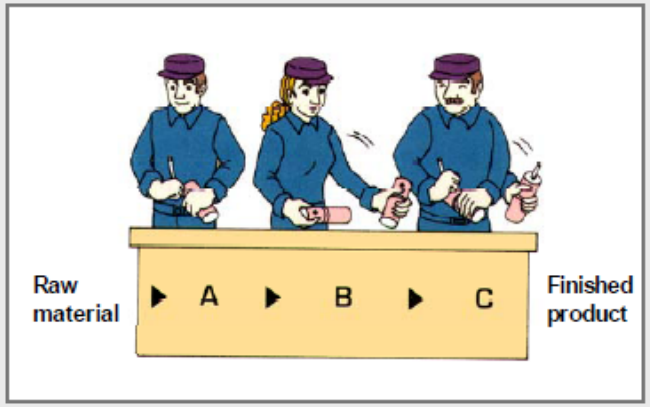
# Reduction of Throughput Time:

**The main objective of lean production is NOT to reduce inventory. (This is a secondary result). It is the reduction of throughput time that is important. This is realized by combining (linking) processes and reducing batch sizes…**

**Batch production**




**One piece flow**




**Advantages**

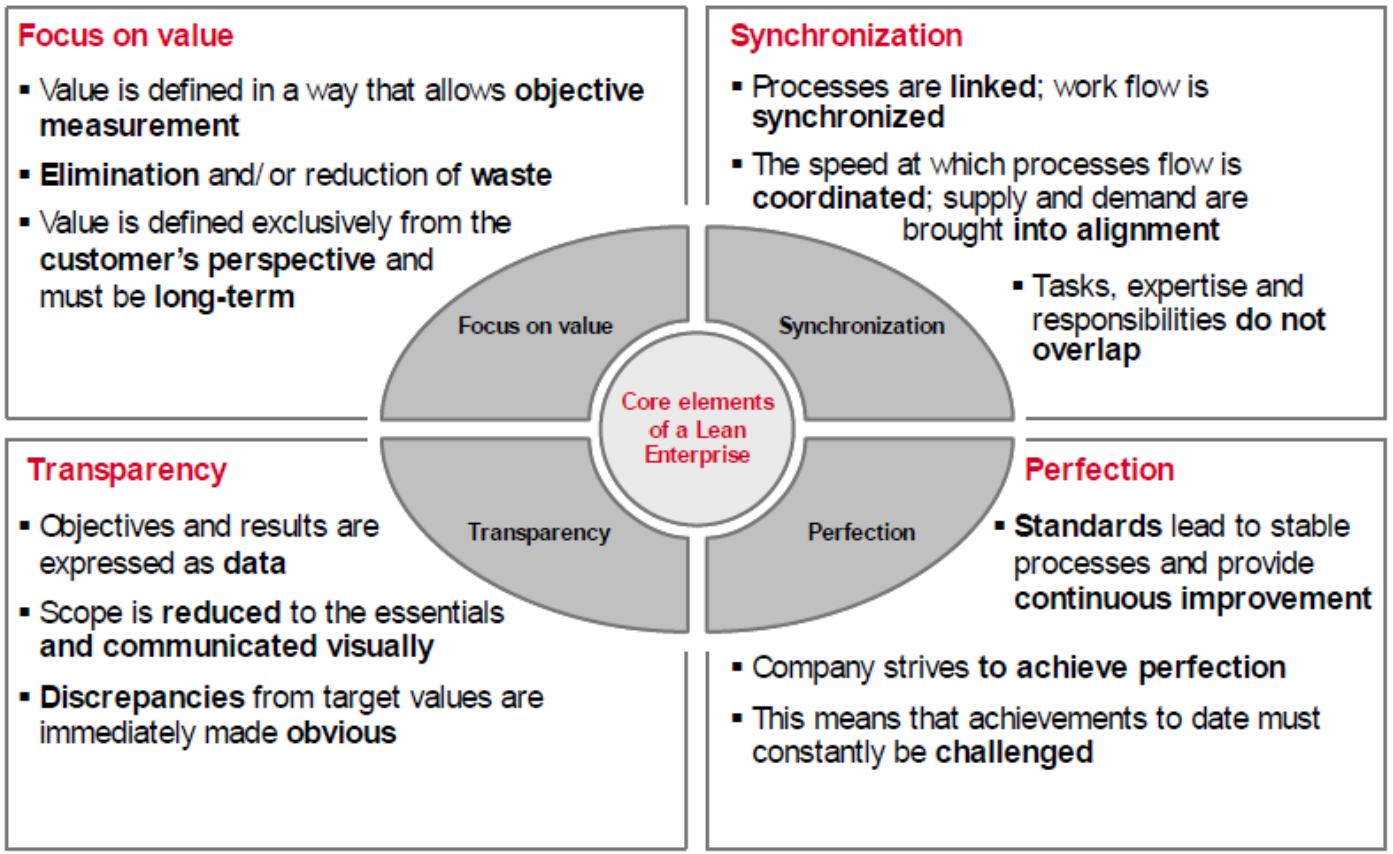
- Minimal throughput times
- No batch inventory
- Minimal floor space required
- High quality

**Premises**

- Synchronization of employees
- Standardized work

# Core Elements:

- **Four core elements of a lean enterprise:**

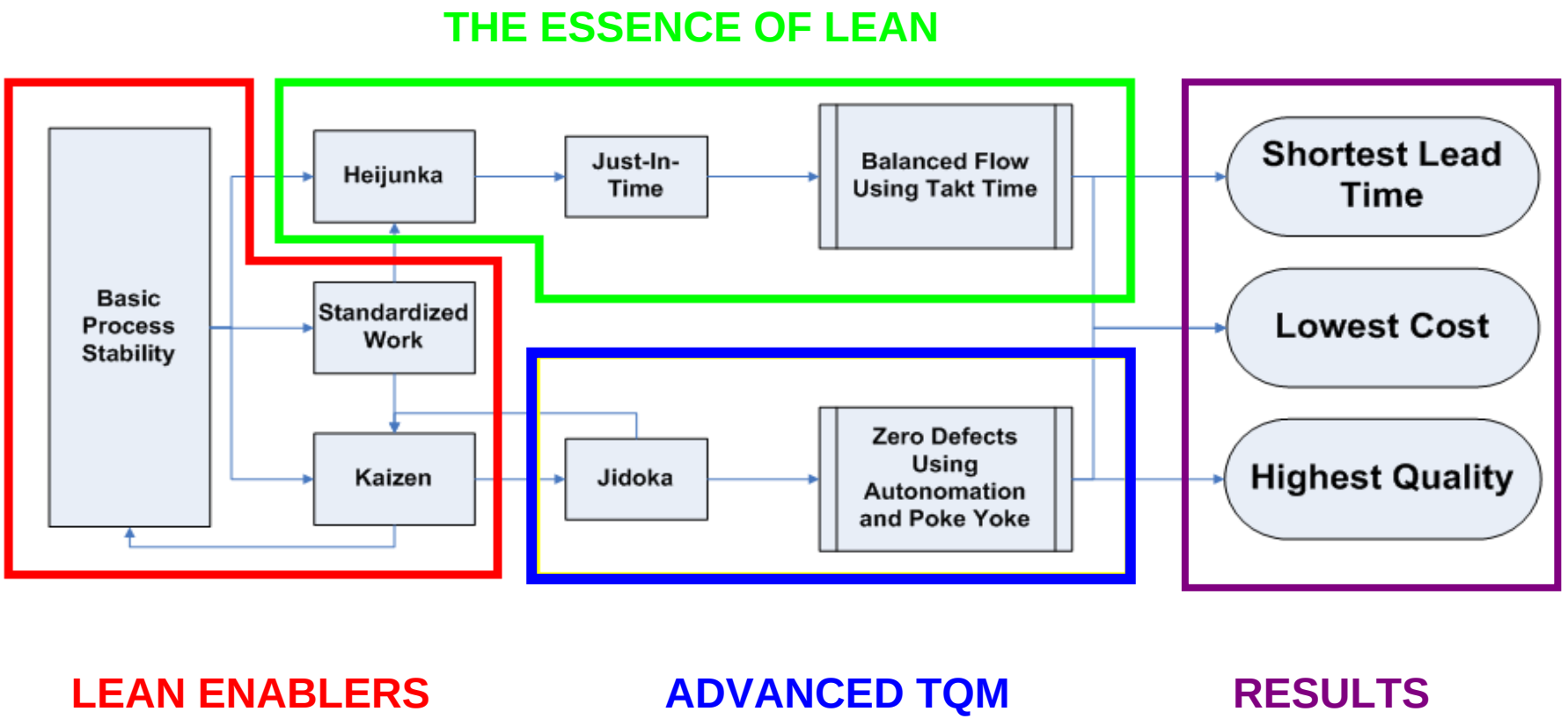


# 5 Lean Principles:

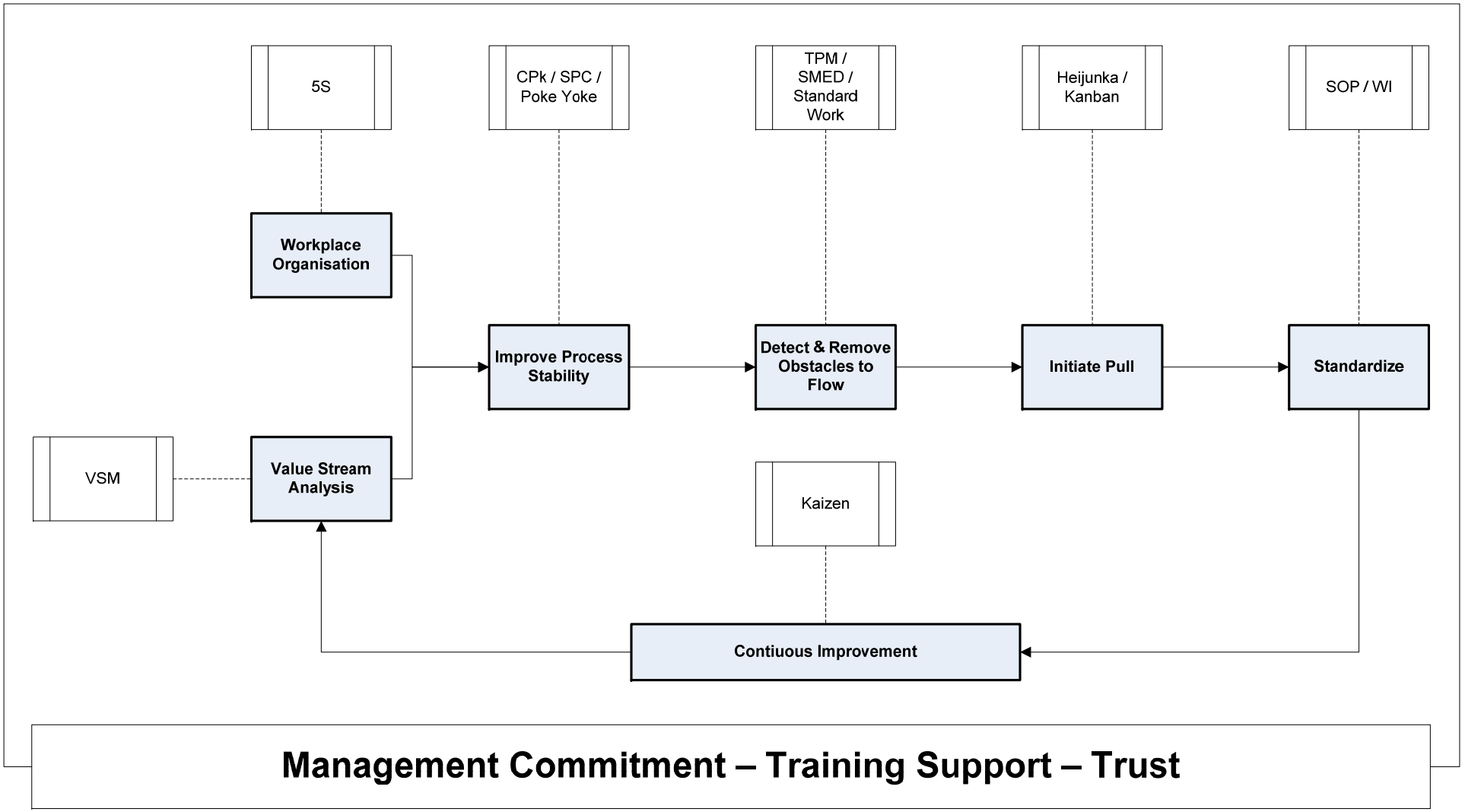
1) Specify *value* from the point of view of the customer;
2) Identify the *value stream* and eliminate waste;
3) Make value *flow;*
4) Then *pull* at the customer's rate of demand;
5) Seek *perfection* through continuous improvement.

Womack and Jones (1996)

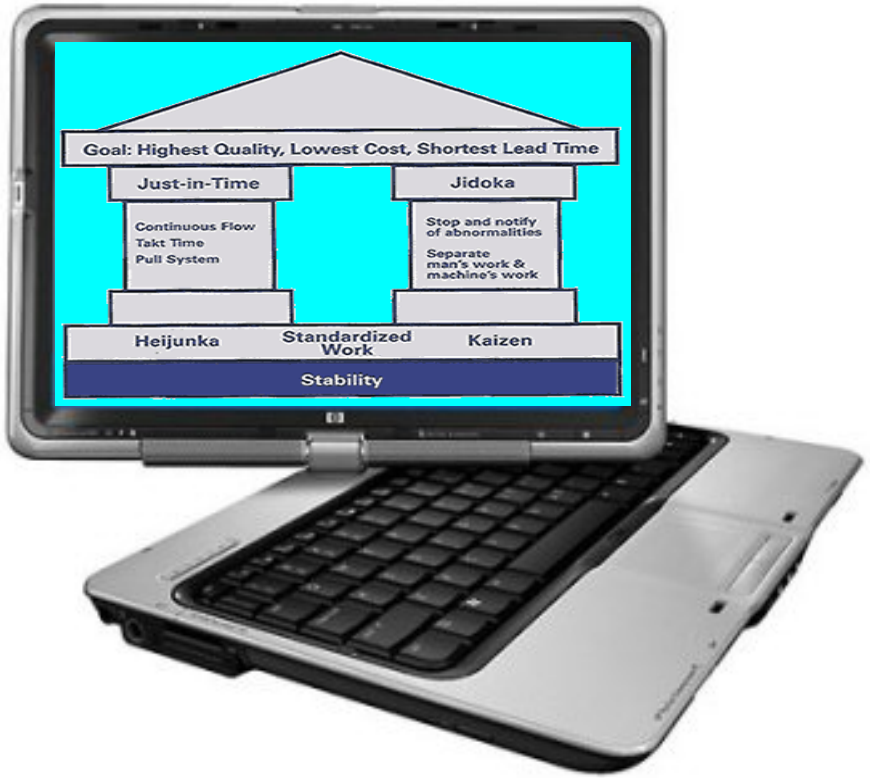
# Lean Production:



# Framework for Lean Implementation:



# Advancing Lean Production: The Role of Information and Communication Technology (ICT)



# State of the Art:

- *…the use of computer systems for organising production logistics would introduce unnecessary cost, overproduction and uncertainty.*

(Sugimori et al., 1977)

- *…no longer is it possible to exclude technology from the lean approach.*

(Bell, 2006)

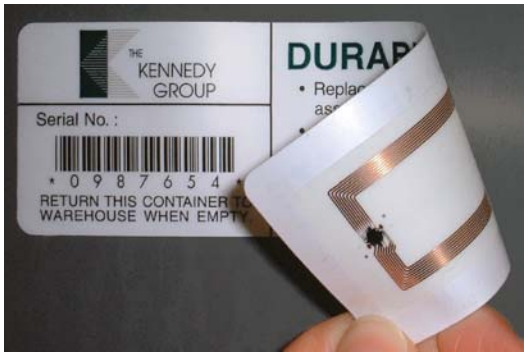
- *…the application of IT and lean principles are claimed to be interdependant and complimentary by some, whilst others have seen the approaches as being mutually exclusive.*

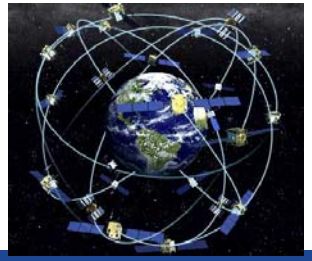
(Riezebos et al., 2009)

# State of the Art:

Push Vs. Pull MRP Vs. JIT IT Vs. Lean

- ***How can the application of advanced ICT support and develop lean production principles?***



# Two Fundamental Concepts of Lean:

- Customer Focused Value Creation
- Single Piece Flow

- Advanced ICT allows "real-time" management of the flow of value creation (E.g. - RFID & RTLS combined with ERP & MES)

# LEAN: What about the PEOPLE!!!