# Wrocław University of Technology

# LEAN MANAGEMENT

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LEAN ENTERPRISE INSTITUTE POLSKA

An affiliate of Lean Global Network

# Lean Global Network

www.leanglobal.org

# Presentation Plan

- Remarks on TPS and perfect processes
- Ongoing lean development
- Lean Education Academic Network
- 2 research projects from WUT in the area of lean

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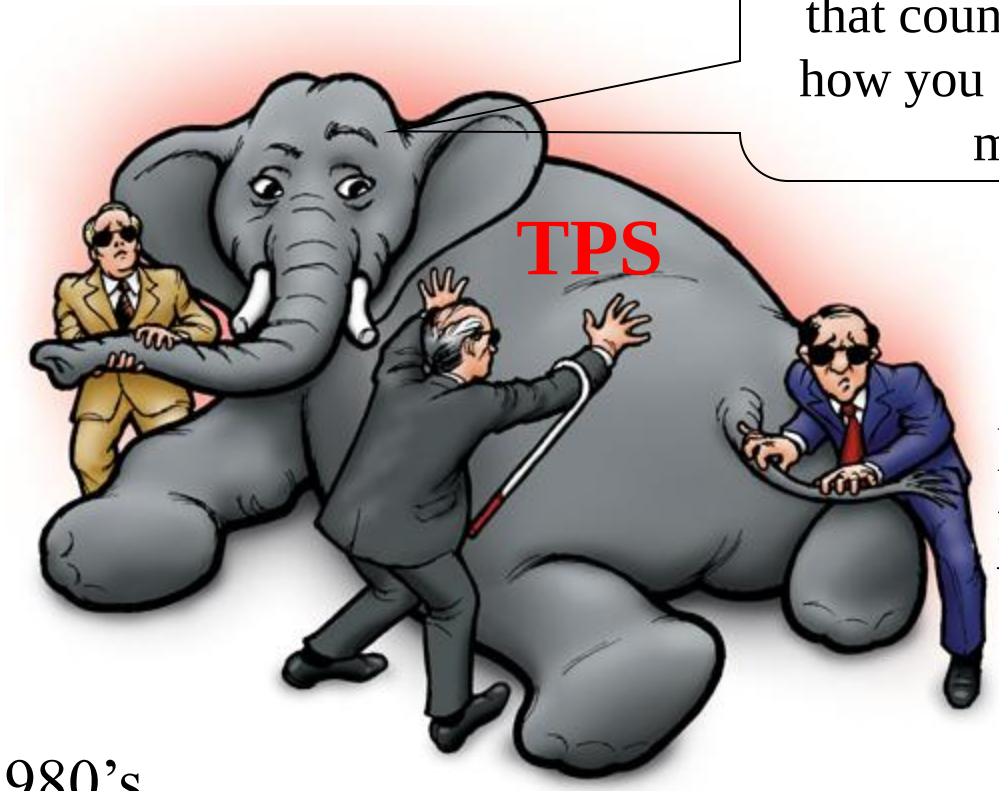
# The parable of the elephant and the blind men…

It is not what you call it that counts but why and how you do it that really matters!




1970's QC circles!

2000 It's all about flow and the Value Stream!

1980's It's Kanban!

1990's It's Kaizen!

# Some Advice from Toyota

**Fujio Cho:**

**“We get brilliant results from average people managing brilliant processes - while our competitors get average or worse results from brilliant people managing broken processes.**

**When they get in trouble, they hire even more brilliant people, but rarely get better results.**

**We are going to win.”**

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# Features of the Perfect Process

**One providing the right value to the customer, in which every step is:**

- **Valuable (no muda: Obsession of Ford & Ohno)**
- **Capable (gives a good result every time: the starting point of Six Sigma)**
- **Available (works when it needs to work: the starting point of Total Productive Maintenance)**
- **Adequate (no bottlenecks: Theory of Constraint and Toyota Production System)**
- **Flexible (able to shift rapidly from one product to the next, and scalable: TPS, SMED)**

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Jim Womack: The Challenge of Lean Leadership, Lean Manufacturing Conference , Poland 2005

# Features of the Perfect Process

**One in which the steps are connected by:**

- **Flow (so that one step leads immediately to the next: A core concern of Henry Ford, as transformed by TPS)**
- **Pull (so that steps are only performed at the need of the customer: A core concern of TPS)**
- **Leveling (so that only true demand is transmitted: A core concern of TPS in the form of heijunka)**

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# Ongoing Lean development

- Is an old idea whose time has come
- It is relevant for businesses in both advanced industrialised countries and in developing countries
- It is relevant for all kinds of industries and activities
- But it involves learning to think differently and to manage differently

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# Ongoing Lean development

Toyota Production System (TPS) is a model for :

- Car manufacturers and 1tier suppliers
- Home appliances manufacturers (e.g.: Whirlpool, Electrolux, BSH)
- Other manufacturing branches: metal cutting, furniture, electronics, medical, etc.
- Product Development
- Service industry
- Administration
- Healthcare

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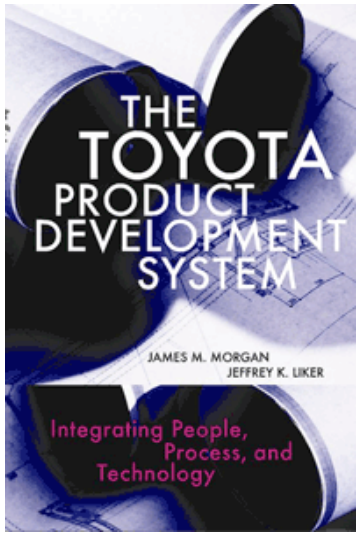
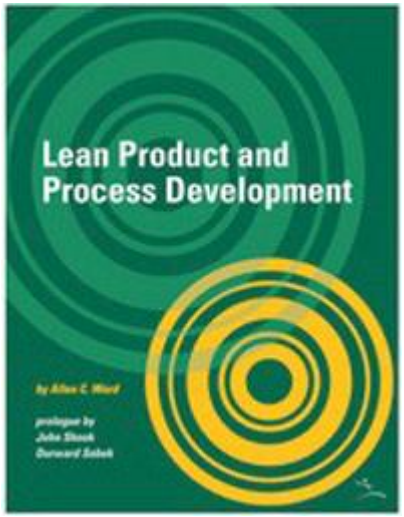
# Ongoing Lean development

## Lean Product Development

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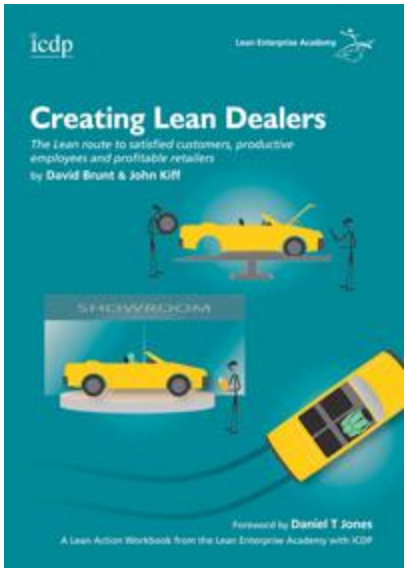
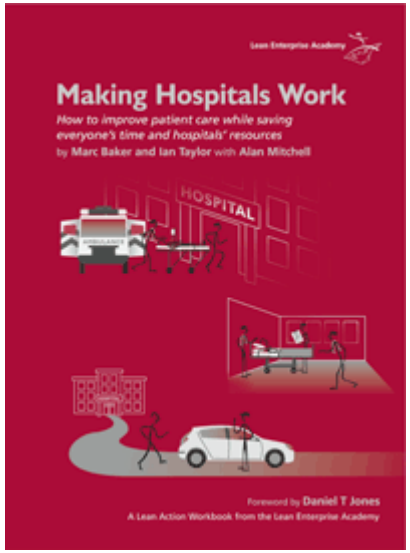
# Ongoing Lean development

## Lean Service




## Lean Healthcare

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# L E A N
# Lean Education Academic Network

- Jim Womack of the Lean Enterprise Institute invited selected academics and industrial VIPs, Aug. 2005
- Goal: Promote Lean in academia and help make it mainstream
- Organization of individuals rather than schools, open to all interested academics, including foreign.

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# L E A N
# Lean Education Academic Network

## Mission

Lean Education Academic Network (LEAN) is a group of university educators dedicated to the task of implementing lean education in US higher academia, as well as continuous improvement of lean education in the classroom through sharing of knowledge and teaching materials, collaboration, and networking among colleagues.

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# http://www.teachinglean.org/

Lean Education Academic Network - Mozilla Firefox

Plik Edycja Widok Historia Zakładki Narzędzia Pomoc

http://www.teachinglean.org/index.php

Google

Często odwiedzane Pierwsze kroki Aktualności

Błąd wczytywania strony | Lean on Campus: Lean Education Academic Ne... | 7857ab42-12fb-476b-a868-1cd86cedc9a8-LEAN... | Lean Education Academic Network

LEAN
LEAN EDUCATION ACADEMIC NETWORK

Professors | Events | Resources | About Lean | Contact Us

teachinglean.org
A place for finding Lean professors and resources

**Resources**

Interested in finding information related to the Lean process? View our list of related websites.

We have a low-volume (e)mailing list for Lean, which provides a convenient way to contact other members of LEAN to share experiences, resources, and ideas about teaching Lean in an academic environment (or questions).

To join, just send an email to Bill Parr (manager of the list) at billparr@gmail.com or billparr@ceibs.edu asking to be added to the list.

**Professors**

Locate professors teaching the Lean process and principles.

Get your information listed. If you are a professor you can get your information listed on this web site.

**Events**

**Current Events: LEAN Educator Conference**

Please see the events page for details.

Enter your email address to receive updates on Lean events.

Submit

Zakończono

Start | 3 Firefox | 3 Microsoft Offi... | - Adobe Reader | Oppenheim Wrocl... | AIM | Microsoft PowerP... | PL | 85% | 16:01

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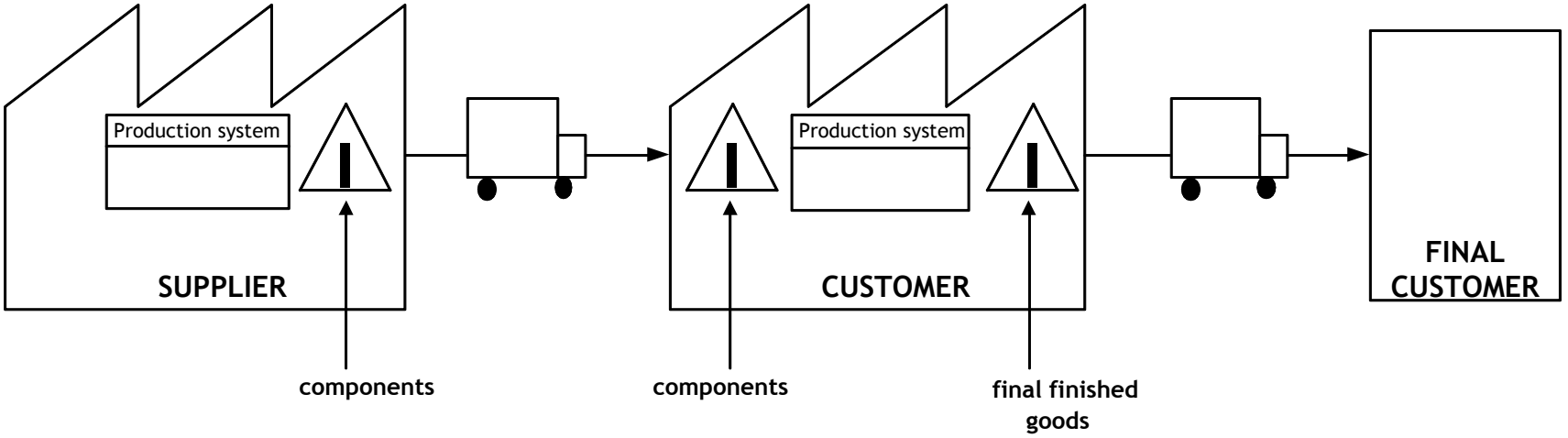
# Integration of supplier and customer's production processes.

Eisler Marek, Horbal Remigiusz
Institute of Production Engineering and Automation

# Project scope

## A Supplier Customer Pair



# Summary of 2 Supplier - Customer pairs analysis

| Analysed pair | Components held at supplier | Transportation frequency | Transportation time | Components held at customer |
|---|---|---|---|---|
| Pair 1 | 14,2 days | 3 x week | 0,1 day | 10,4 days |
| Pair 2 | 8,3 days | 1 x week | 0,1 day | 9 days |

# How to reduce inventory in the pair - according to eVSM methodology

Reduction of inventory levels in supply chain can be achieved by:

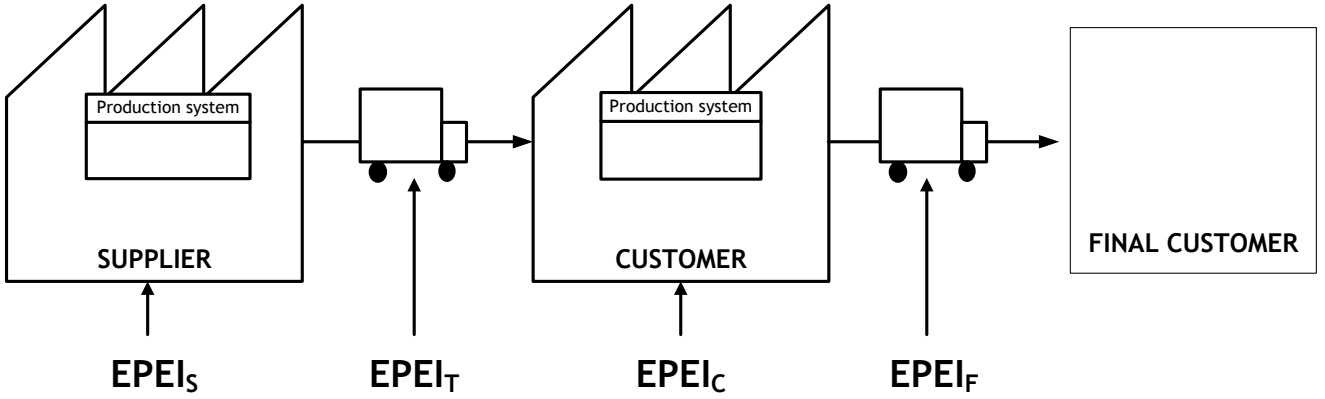
- increasing delivery frequency,
- decreasing batch sizes,
- improving capability.

**However, all those action undertaken separately, without synchronisation, may lead to sub-optymizing of particular supply chain link.**

**What are the goals?**

# Supplier Customer Production processes Integration – EPEI indices

**EPEI (Every Part Every Interval) indicates the period in which all different part numbers are produced in a production process or shipped from one plant to another.**




| Index used in SCPI methodology | Definition used in SCPI methodology |
|---|---|
| $EPEI_F$ | The period of deliveries from the customer to the final customer |
| $EPEI_C$ | EPEI index of customer's production system |
| $EPEI_T$ | The period of deliveries from supplier to customer |
| $EPEI_S$ | EPEI index of supplier's production system |

# The lowest standard inventory in a Pair

$$\mathbf{EPEI_S = EPEI_T = EPEI_c = EPEI_F}$$

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# Methodology of designing disassembly and reassembly processes using Lean Thinking approach

**Tomasz Kanikuła, Tomasz Koch**
**Centre for Advanced Manufacturing Technologies (CAMT), Institute of Production Engineering and Automation, Wroclaw University of Technology, Poland**

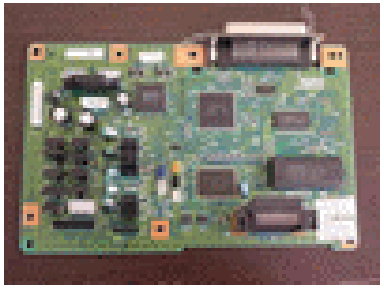
# Remanufacturing

- Disassembling
- Cleaning
- Inspection
- Repairing
- Replacing
- Reassembling

# Needle printer Remanufacturing

controller

head



board

Power supply adaptor

tape with ink

control panel

# Lean Remanufacturing - problems

- not every remanufacturing operation is always needed,
- difficulties in definition of takt time,
- cycle times varies,
- quantity of disassembled parts varies,
- quality of incoming products varies,
- diversity in range of products,
- possible huge amount of cores,
- sometimes no high-runners.

# Lean Remanufacturing - how to start

1. Step: applying Glenday Sieve to chose pilot area

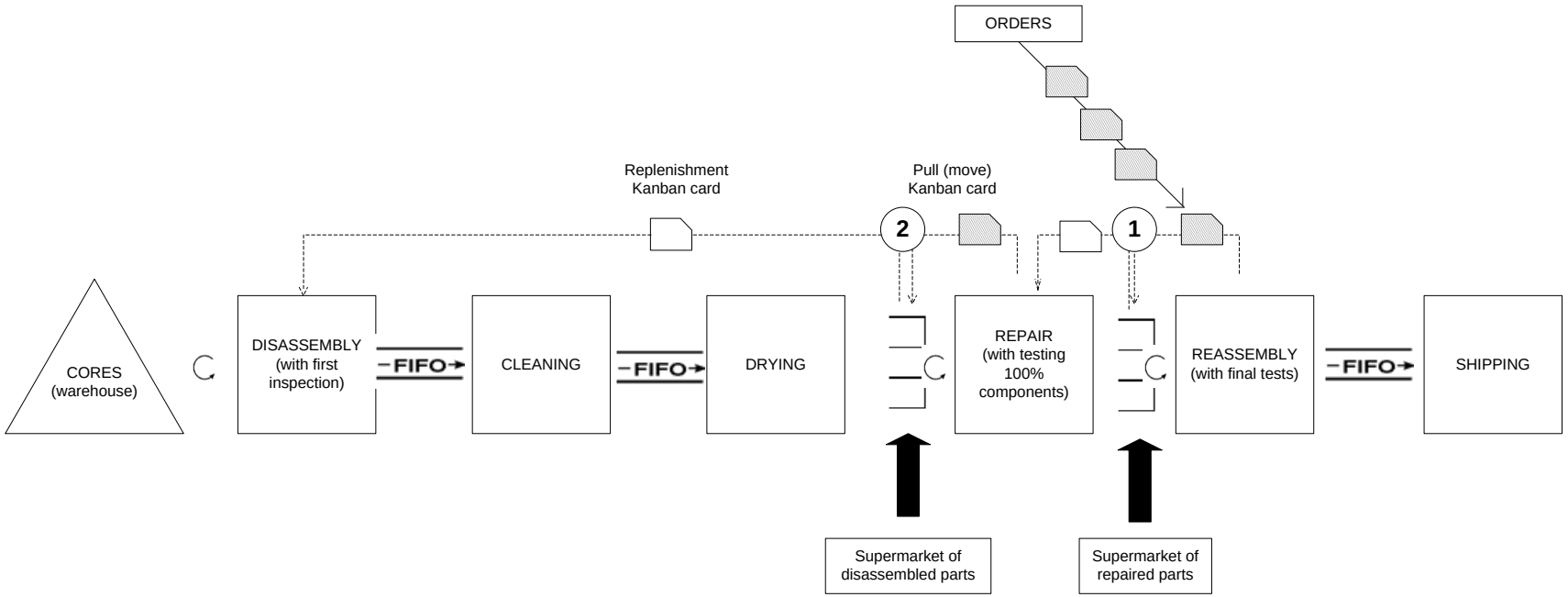
| % Cumulative Sales | % Product Range |
|---|---|
| 50% | 6% |
| 95% | 50% |
| 99% | 70% |
| 1% | 30% |

2. Step: choosing one of nine scenarios of material and information flows

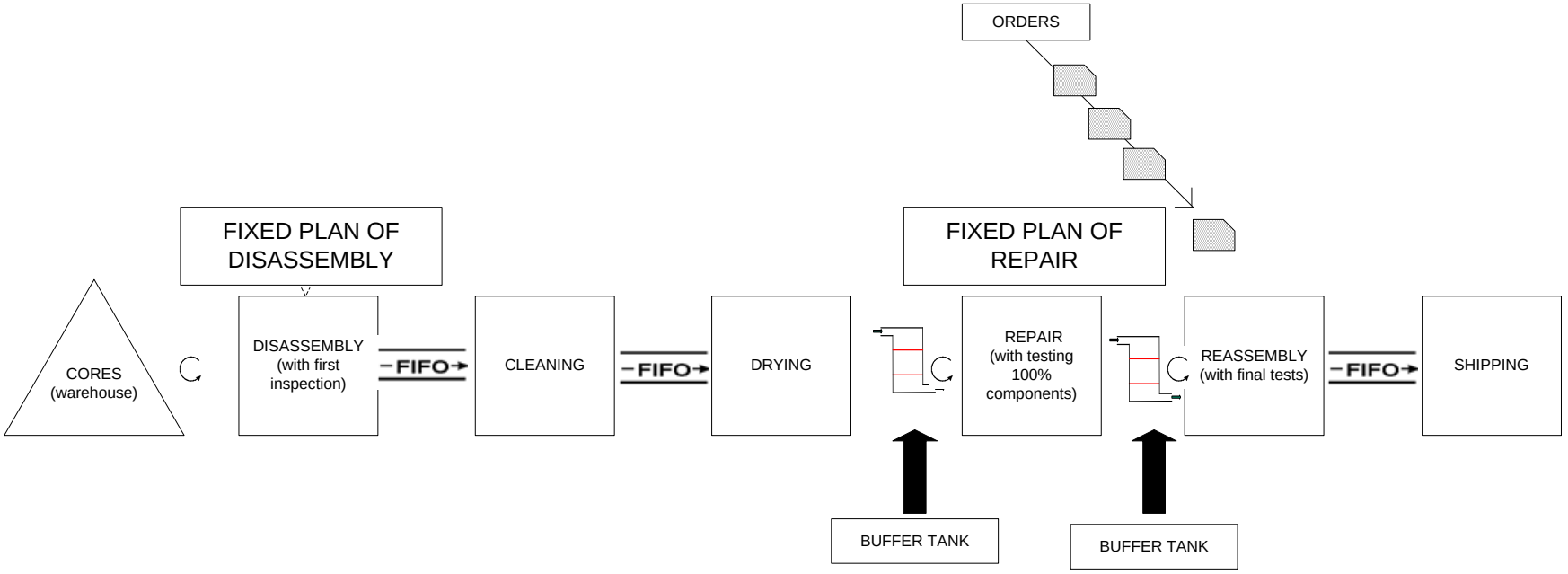
# Matching scenario with current Remanufacturing condition

| Features of Remanufacturing: | Scenarios | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Instability of repair cycle time | • | • | | | | • | | • | • |
| Instability of disassembly cycle time | | • | • | | • | • | • | • | • |
| Unstable recovery percentage at repair | • | • | | | | • | | • | • |
| Unstable recovery percentage at disassemble | | • | • | | • | • | • | • | • |
| Not enough place for core (used products) | | | | | | | • | • | • |
| Disassembled parts inventory recommended | | • | • | | • | • | | | |
| Repaired parts inventory recommended | • | • | | | | • | | • | • |
| Finished products inventory recommended | | | | • | • | • | | | |
| No need to control disassembly process | | | | | | | • | • | • |
| Repair is expensive and time consuming | | | • | • | • | | • | | |
| Disassemble is expensive and time consuming | • | | | • | | | | | |
| High cost of finished products inventory | • | • | • | | | | • | • | • |
| Different cycle time in each process | | • | | | | • | | • | • |

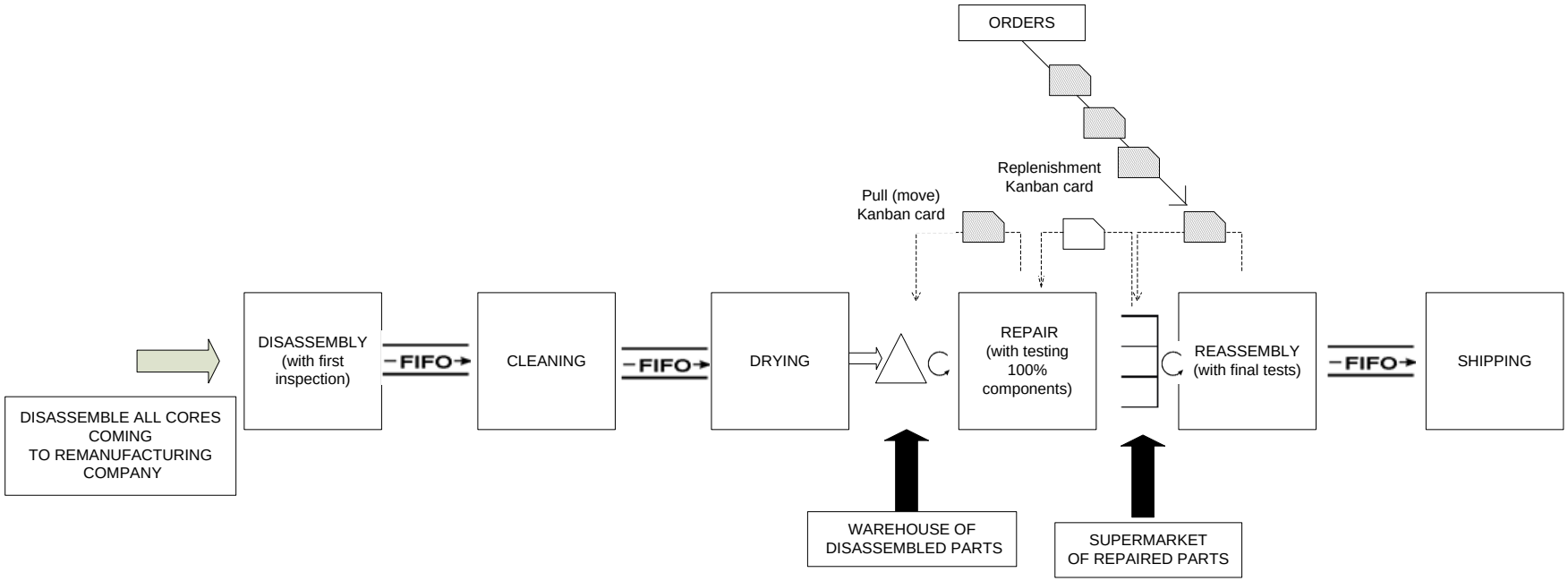
# Scenario 2 - Two supermarkets for disassembled and repaired parts



# Scenario 6 - Fixed sequence and volume cycle in disassembly and repair processes



# Scenario 8 - Warehouse of disassembled parts & Supermarket of repaired parts

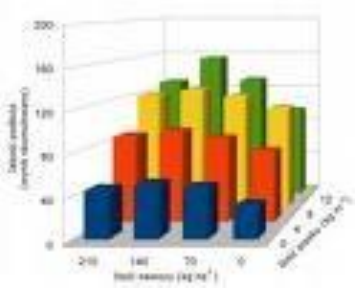


# Testing

- in real industrial environment
- simulation  (in progres)


# Expected results and Conclusion

- improvement of consumer service,
- improvement of Lead Time,
- decrease of finished products stock,
- decrease of value of new parts in remanufactured products,
- decrease in number of cores that have to be disassembled to remanufacture ordered number of products,
- reduced space needed for cores,
- reassembly process has always available parts,
- ability to manage changing orders, flexibility,
- fixed sequence and volume gives potential for economies of repetition,
- no delays in repair process.



# Thank you for your attention!

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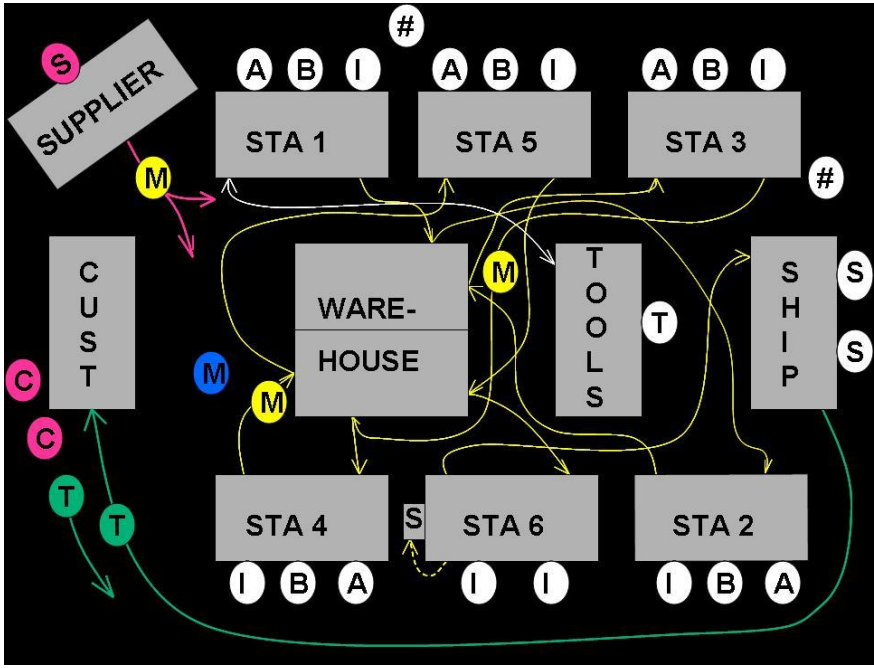
# Management & Production Engineering study course

## Lean Manufacturing Simulation – license from University of Kentucky

**Introduces lean manufacturing concepts:**

- Rationalized process flow,
- Visual control,
- Continuous improvement-Kaizen,
- Standardized work,
- Team communication,
- Lot size reduction,
- Quality at the source,
- Pull system,
- Mixed model line balancing,
- Build to customer order,
- Team member empowerment.

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# Management & Production Engineering study course

## Lean Manufacturing Simulation

- 4 simulated shifts (16 hours),
- 3 types electronic circuit boards, functional products,
- some complexity, 11 components per assembled board,
- 9 part numbers used, 6 or 7 per assembly,
- 19 assembly and test steps,
- Measurables improve by factors of 5 or more:
  - ✓ cost,
  - ✓ production,
  - ✓ lead time,
  - ✓ customer satisfaction.

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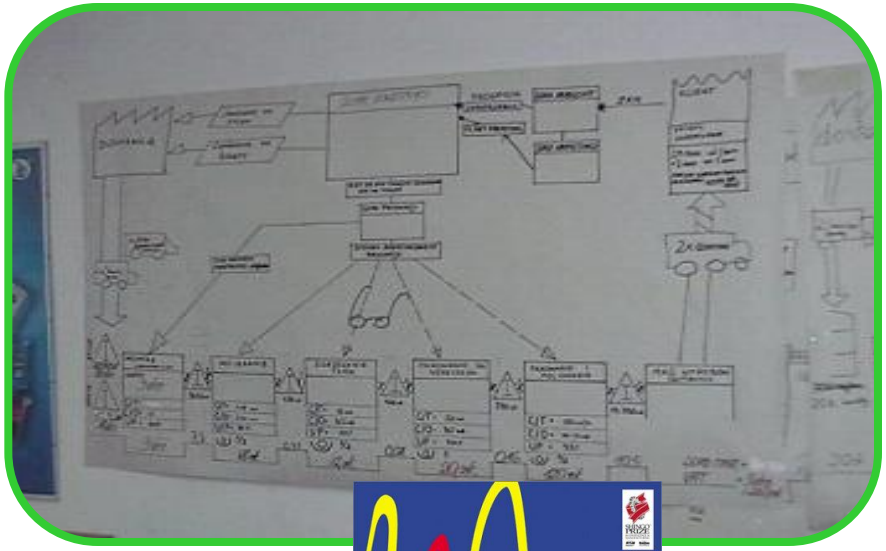
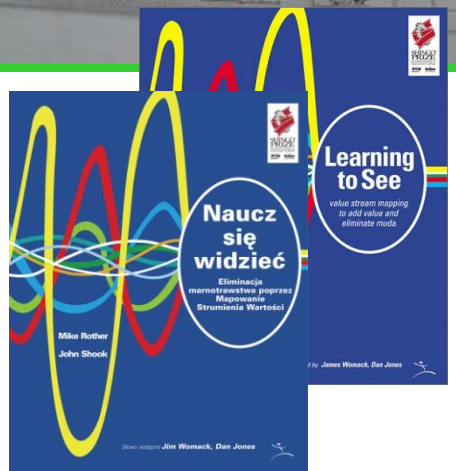
# Management & Production Engineering study course

## Product value stream study – 15 h.project

- Students divided into teams of 3-5
- Visit company in Wroclaw or surrounding area.
- Using Value Stream Mapping method to draw current flows of both material and information
- At the end of the project students make presentation to the representatives of companies where products is manufactured.



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