IPA Slovakia

Fraunhofer

LINET®

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From Newcomer to Market Leader – Success Through IE Methods and Innovations

IIE Annual Conference, Nashville 2007, USA

Program

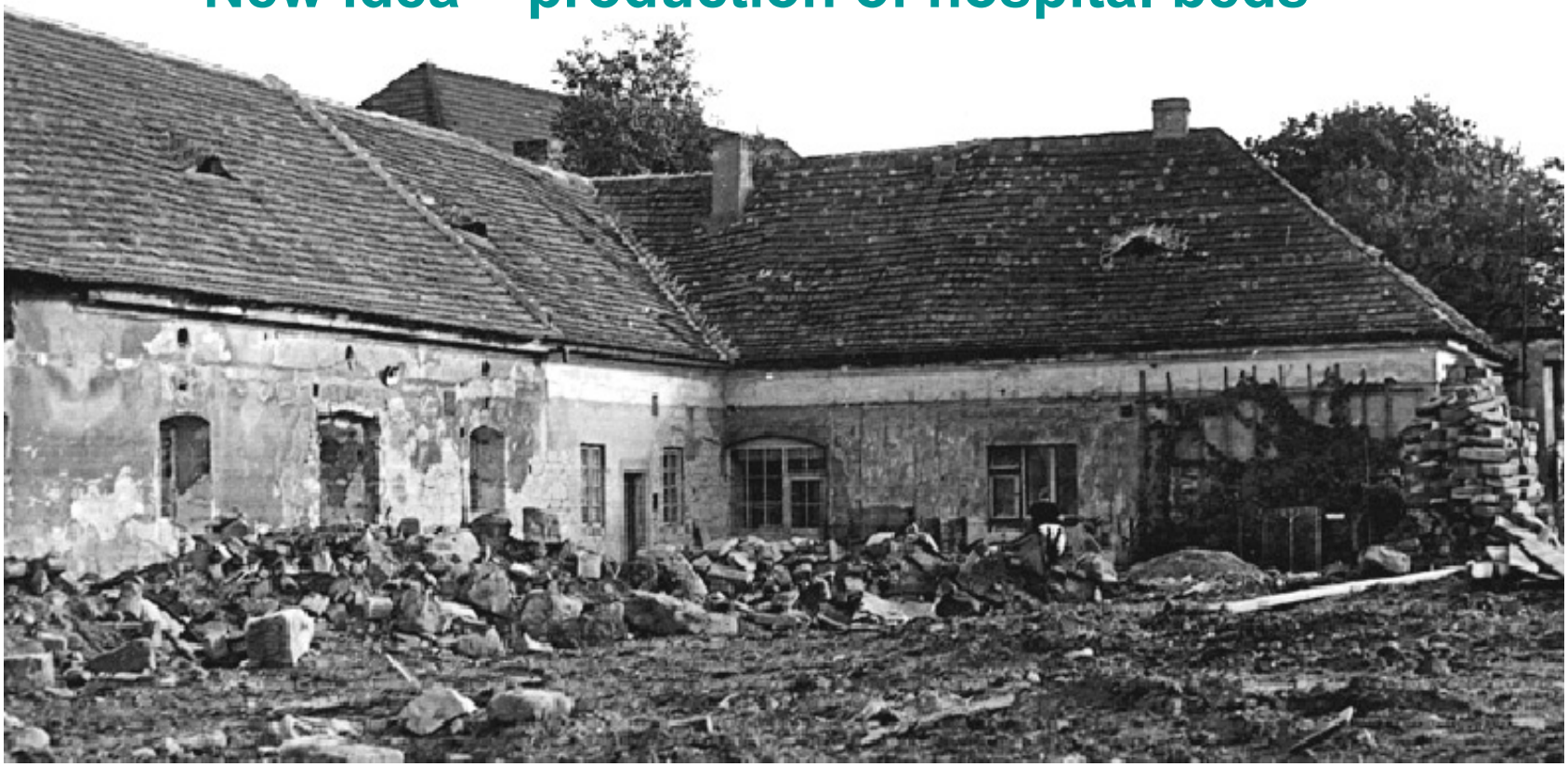
1. Introduction
2. Linet story
3. Implementation of IE methods - examples
4. Innovation management - example
5. Linet production system
6. Experience and summary

Zbynek Frolík – Founder and Managing Director of Linet (Czech republic)

Jan Kosturiak - Managing Director of Fraunhofer IPA Slovakia (Slovakia)

1990 – after political changes in Czechoslovakia – 15000 Tsd USD starting investment – old agricultural farm

New idea – production of hospital beds



- Missing market, products, customers, production equipment, production skills

+ Flexible, hard working employees from agriculture, strong motivation, basic entrepreneurial skills and knowledge from medical care (Z.Frolik worked as technical manager in a hospital and some years ago he started his own business – flower farming and selling)

2000

- 12.000 m² Production area

- 230 Employees / modern production technology and organisation

- Turnover 19 Mil. USD

2002

- 21.000 m² Production area

- 275 Employees / new assembly, dispatch, development centre

- Turnover 32 Mil. USD

2006

-23.000 m² Production area

- 320 Employees/ Research, Development, Innovation and Training Centre

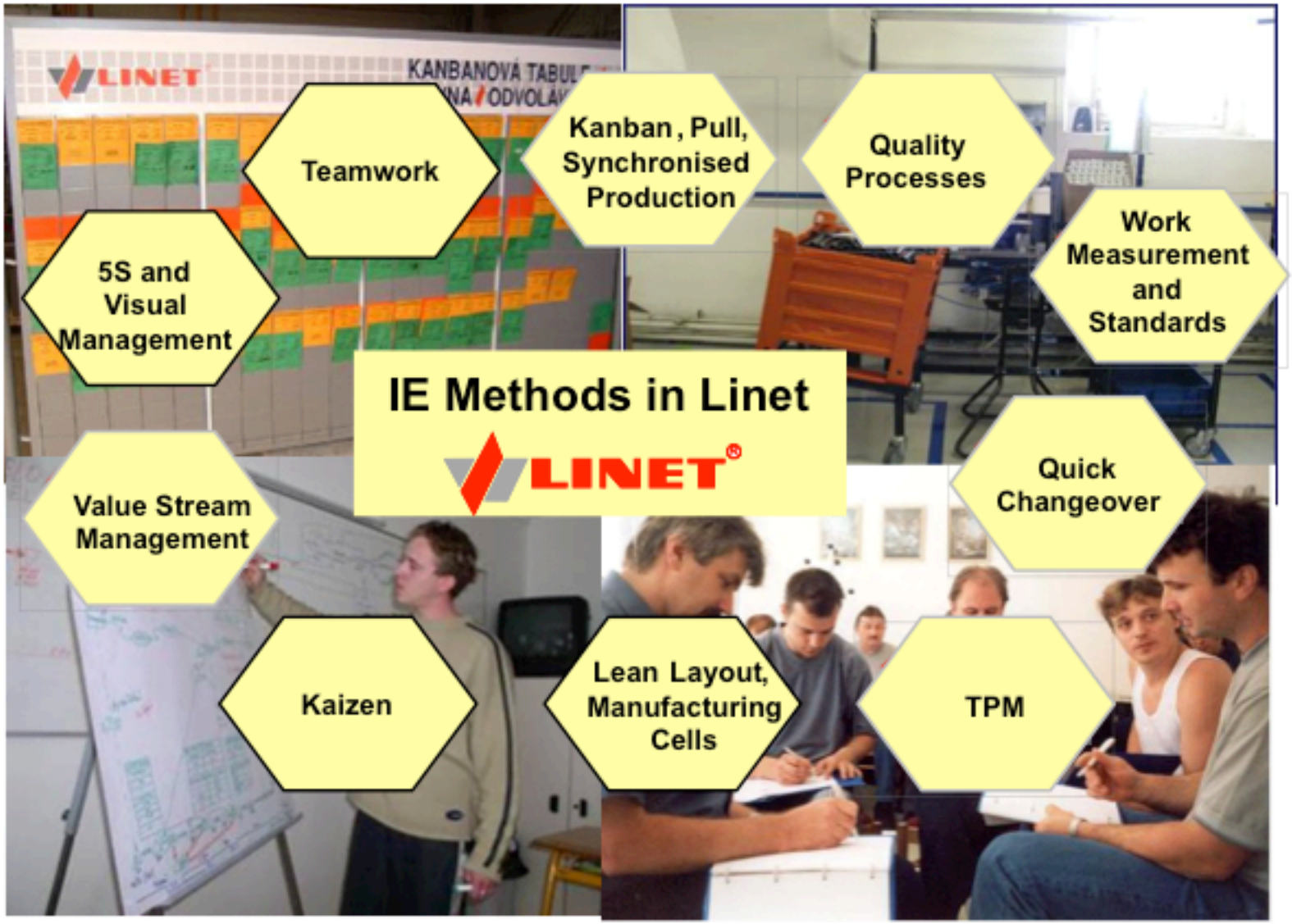
- Turnover 70 Mil. USD

2007 - 2012

- Goal – Turnover 200 Mil. USD
- New production facilities and development centre
- New production plants in China, Mexico, UK

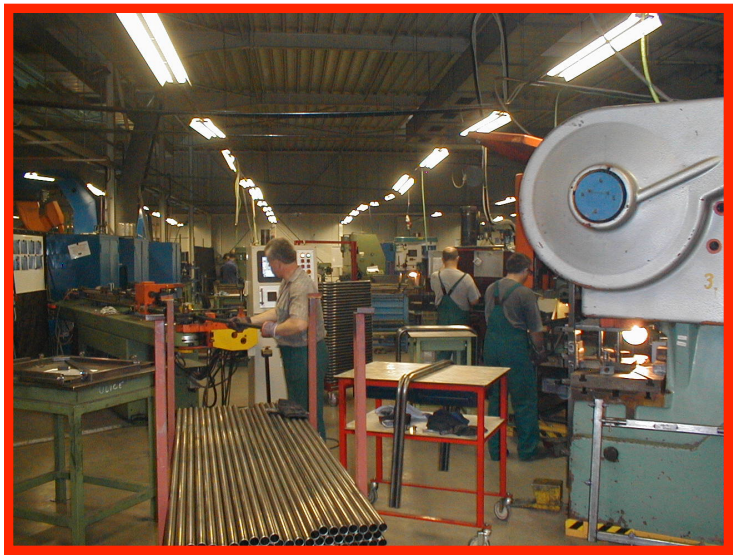
Milestones and success factors

1. Starting with Common Sense and Simple Industrial Engineering Methods
2. Flexible Team Based Organisation Structure
3. Customer Orientation and Strong Focus on Product and Process Innovation
4. Development of Human Skills and Knowledge
5. Development of Linet Production System – Lean and Innovative Enterprise


Teamwork
Kanban, Pull, Synchronised Production
Quality Processes
5S and Visual Management
Work Measurement and Standards
IE Methods in Linet
LINET
Value Stream Management
Quick Changeover
Kaizen
Lean Layout, Manufacturing Cells
TPM

Analyse the Video

1. **Where are the added value and non added value activities?**
2. **How to reduce waste?**
3. **Lesson from this example?**



Material Preparation – Sawing, Bending, Laser

↓

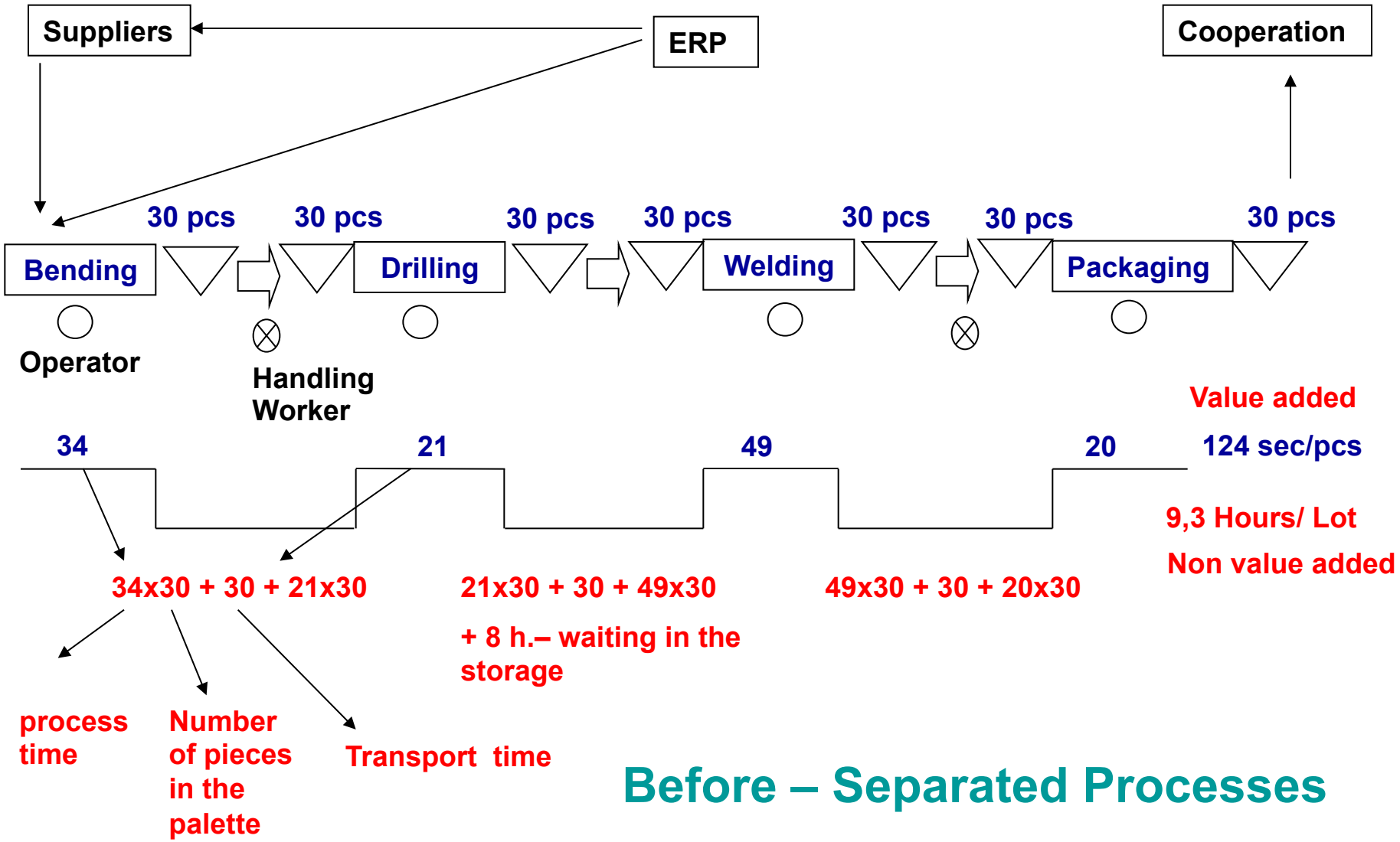
Machining – Turning, Drilling, Milling, Grinding

↓

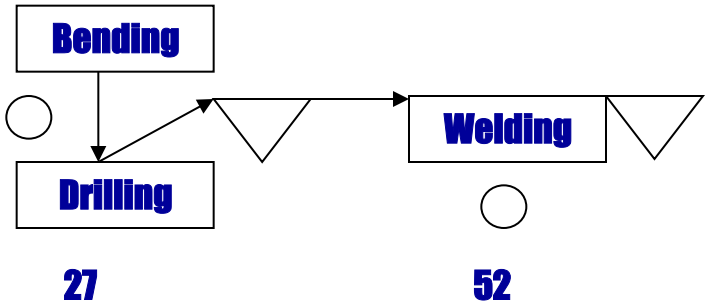
Welding

↓

Co-operation, Assembly



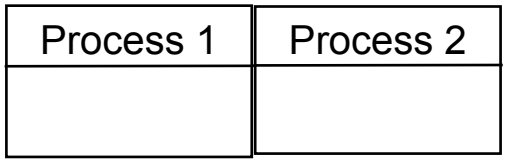
Before – Separated Processes



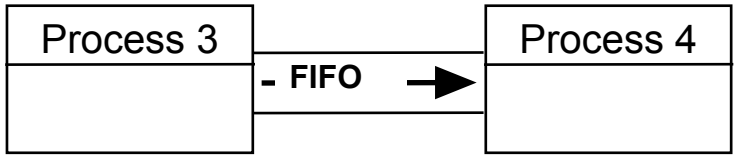
	Before	After
Total process time / piece	124 sec	79 sec
Waiting and transport times	9,3 hours	20 sec
Operators	4	2
Handling workers	2	0
WIP	Min. 210 pcs	30 pcs

After – Manufacturing Cell

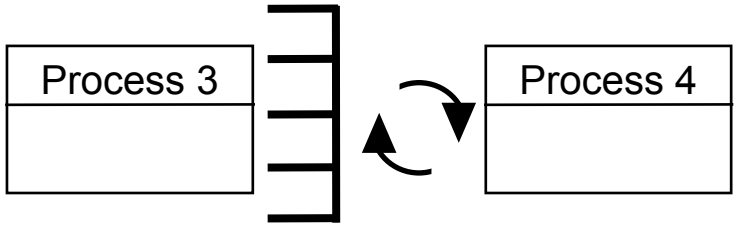
Value Stream Improvement Principles



1. Flow production – when possible



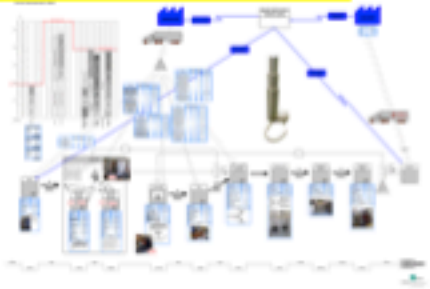
2. Otherwise FIFO Buffer



3. Or Supermarket

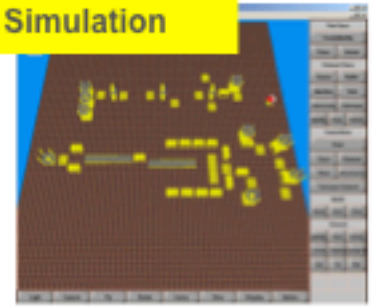
Standardised process planning

1.Value Stream

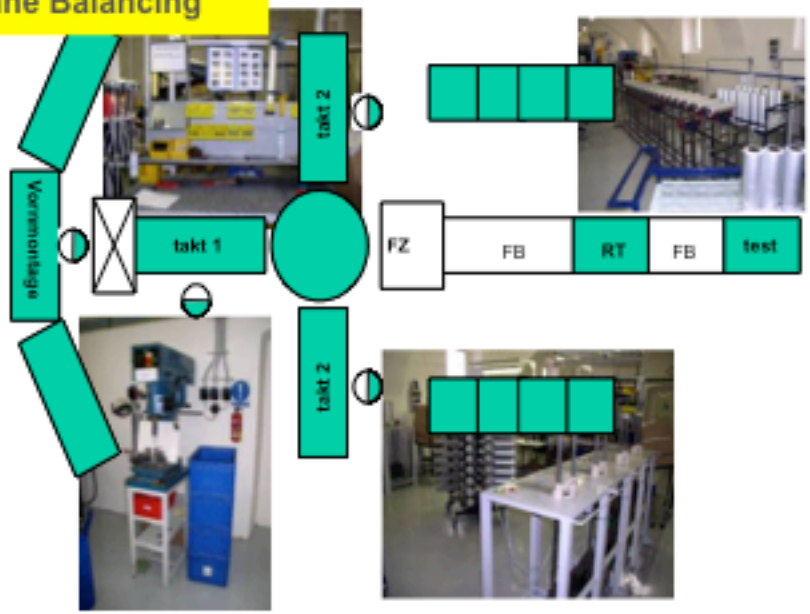


2. Time Measurement

4. Simulation

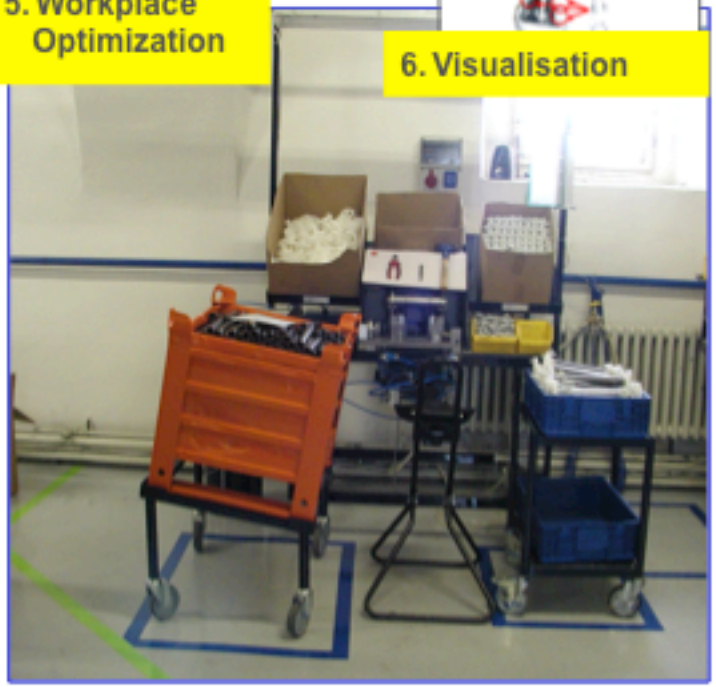


3. Line Balancing

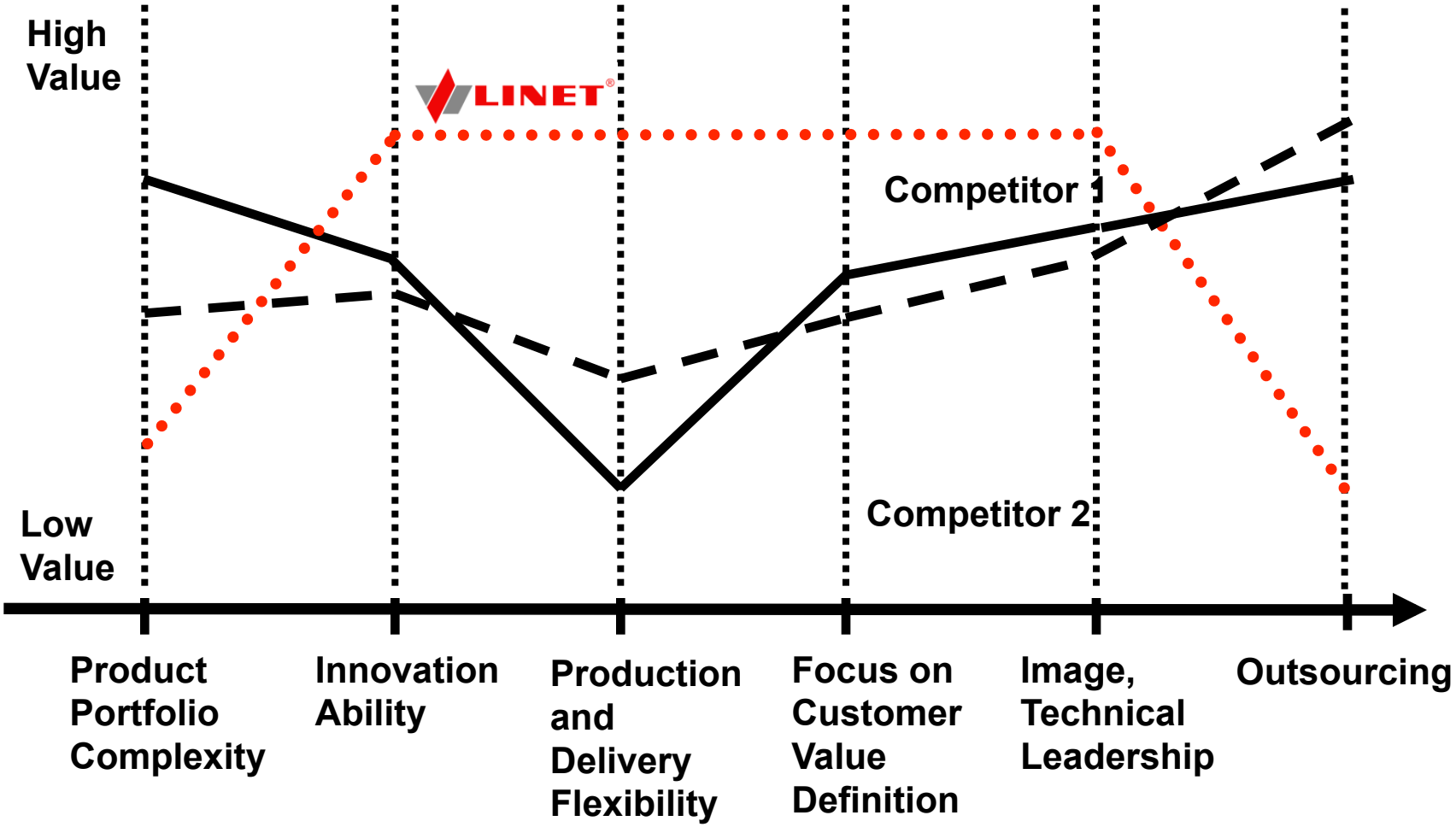


5. Workplace Optimization

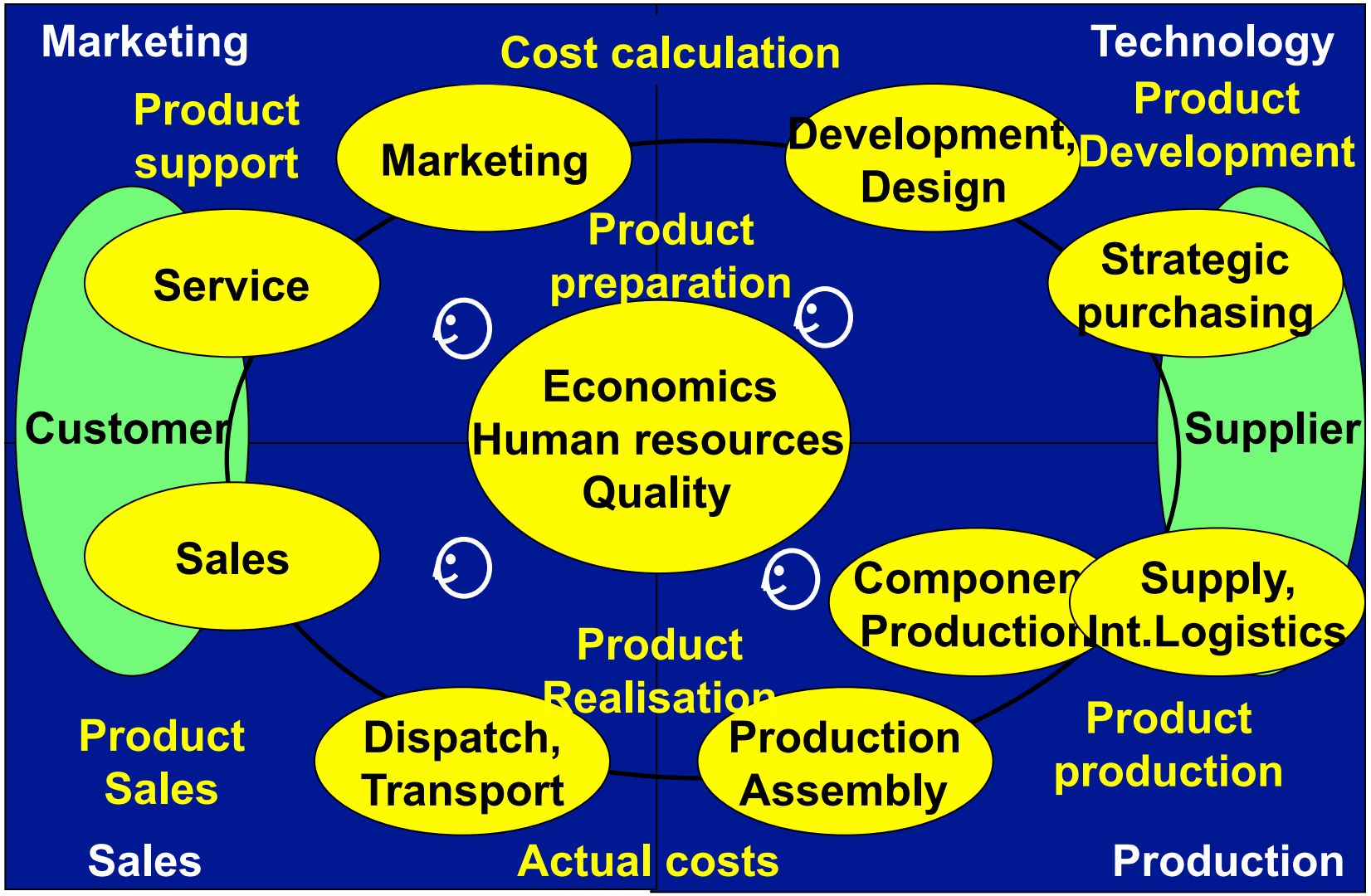
6. Visualisation



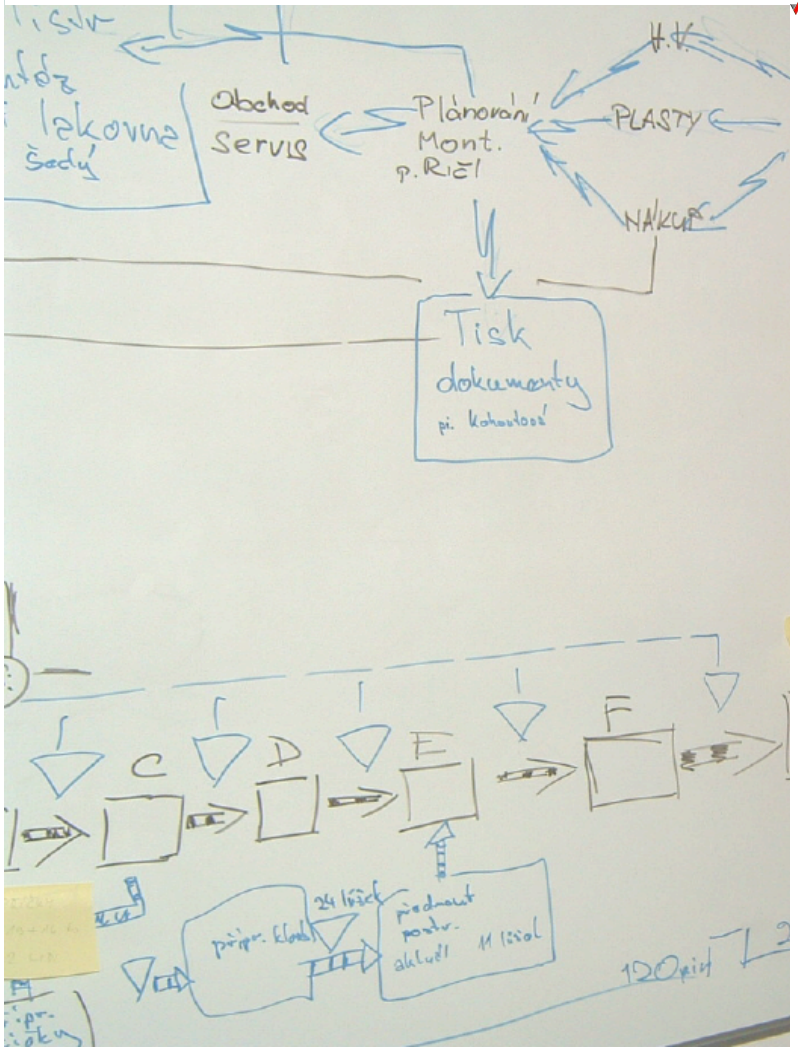
Customer Value Definition

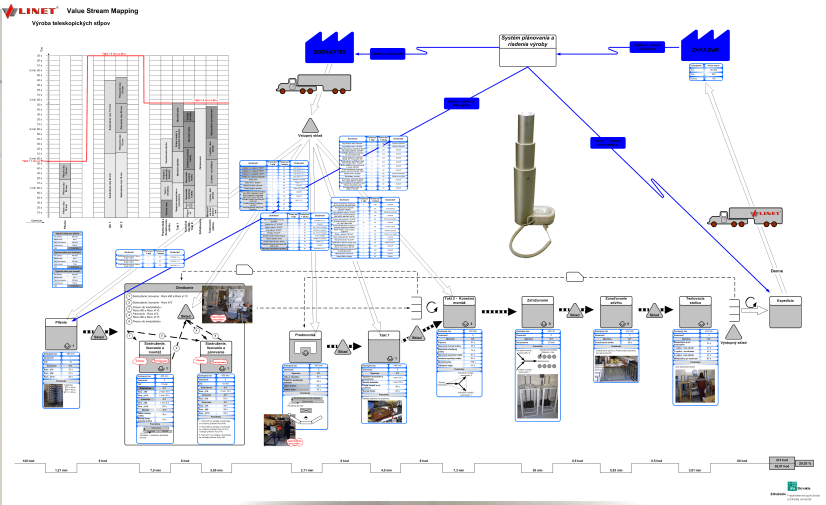


Organisational Structure



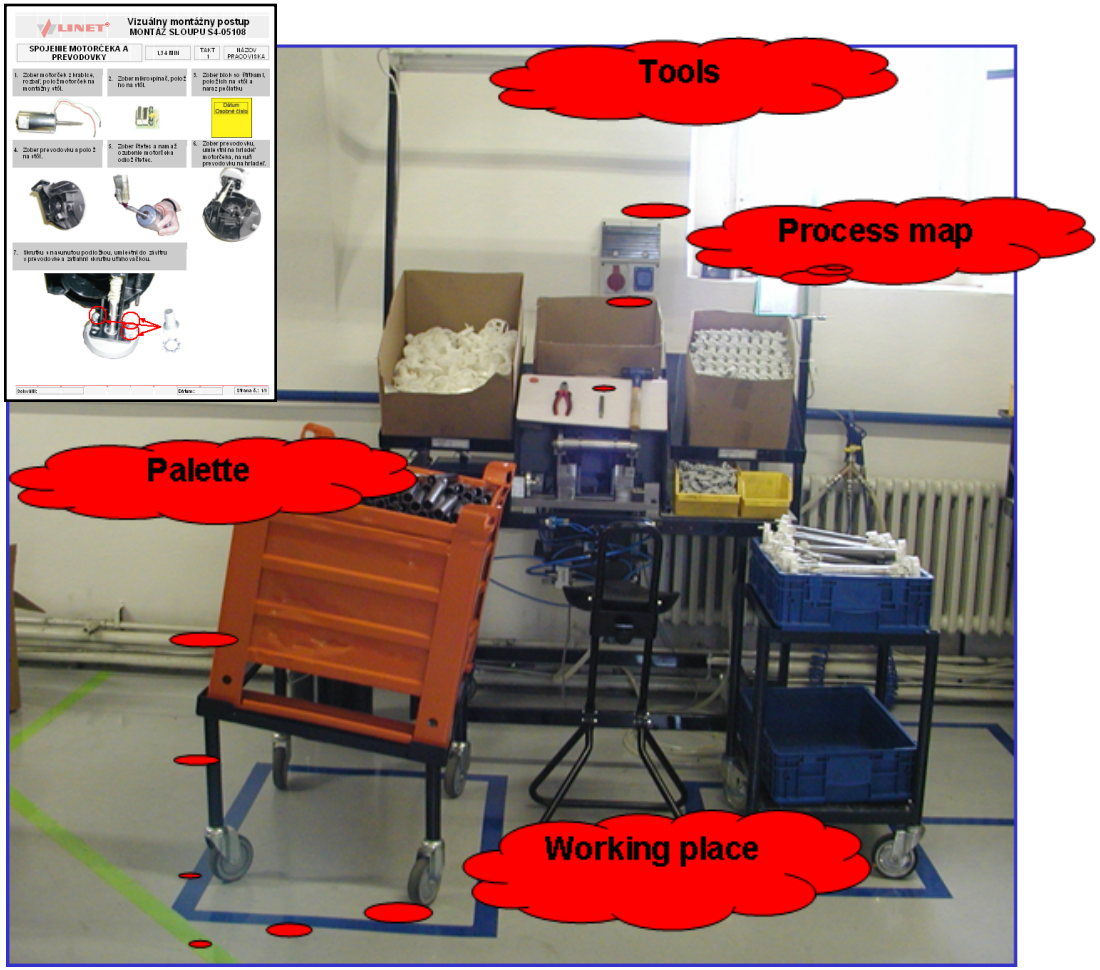
Value Stream Management





Lean Workplace

1. Work measurement and standardisation
2. 5S
3. Ergonomics
4. Visual Controls
5. Mistake proofing
6. Jidoka, stop line



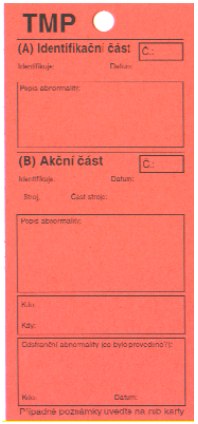
Flexible and Mobile Machines and Layout

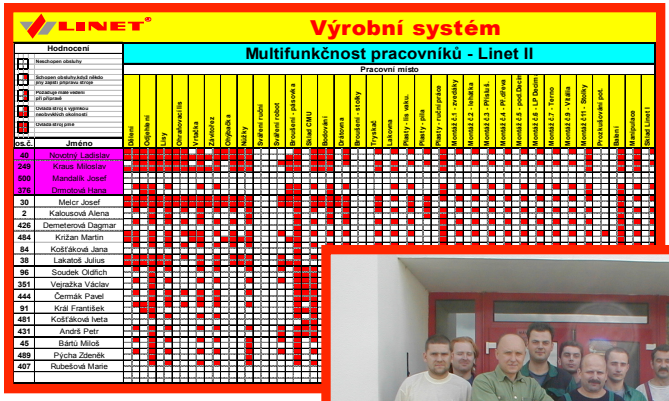
Air bolster

Flexible and Mobile Machines and Layout

Flexible Workforce, Teams

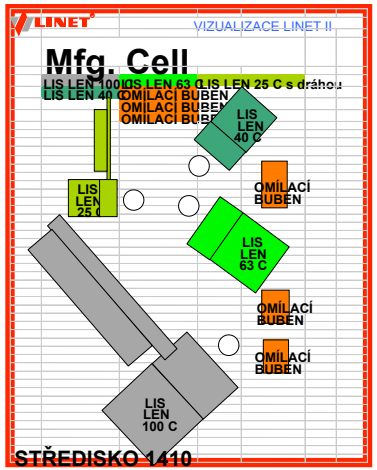
1. Keeping and improving process standards
2. Work organisation
3. Autonomous maintenance
4. Cleanness and order
5. Quality and safety



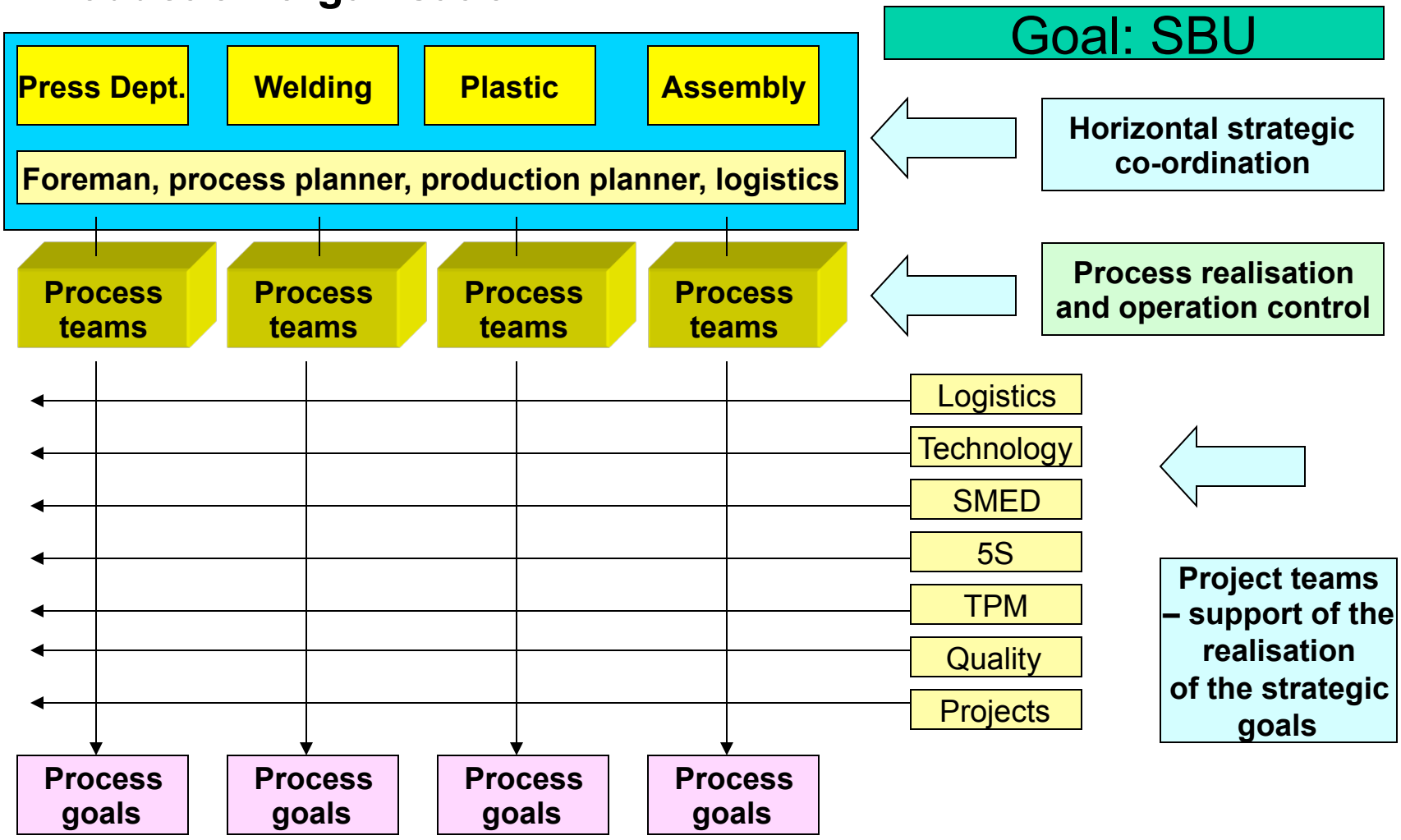


Flexible Manufacturing Cells

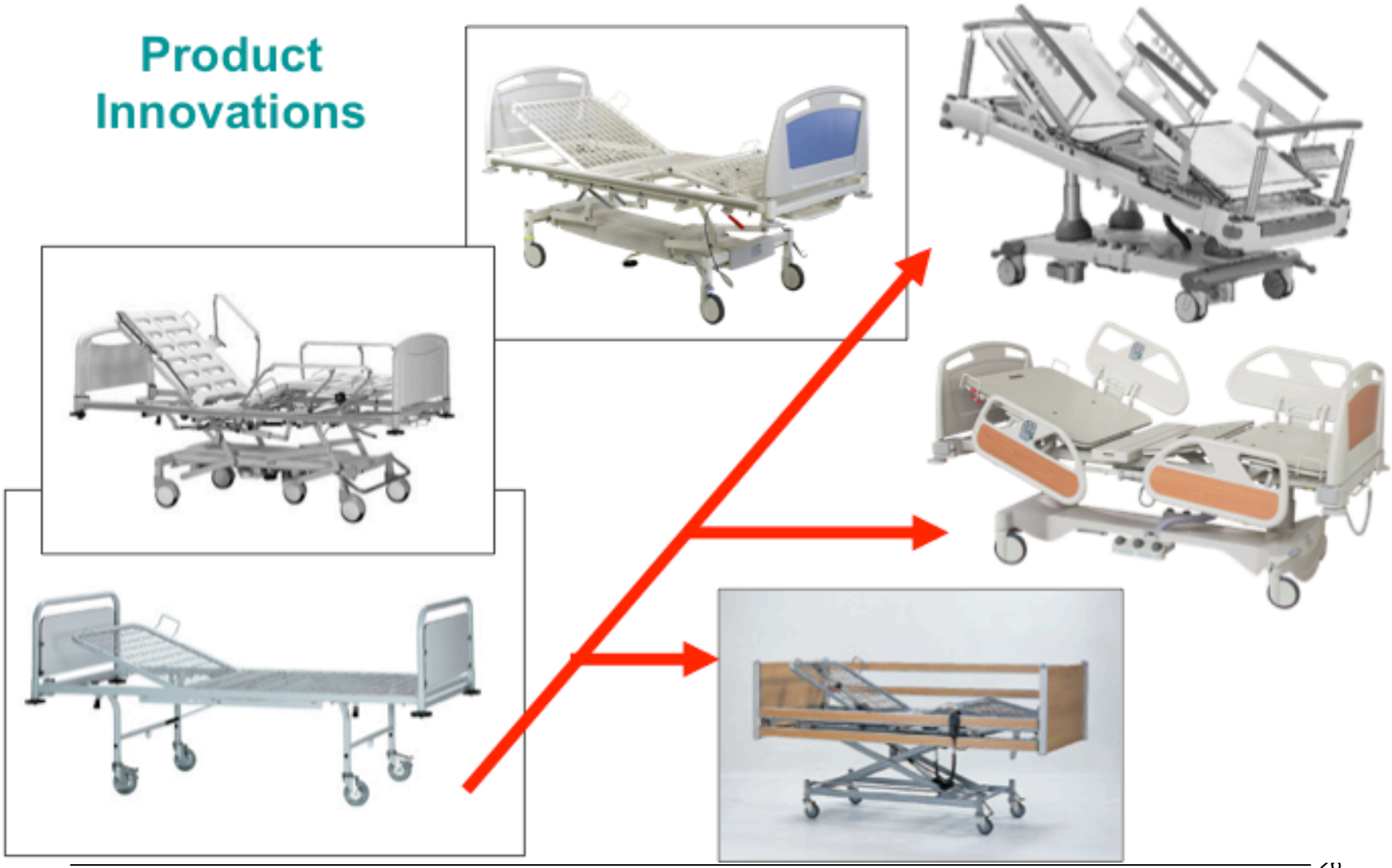
1. U Shape line
2. Low cost automation – chaku chaku
3. Modular machines
4. Quick setup
5. Flexible line occupation



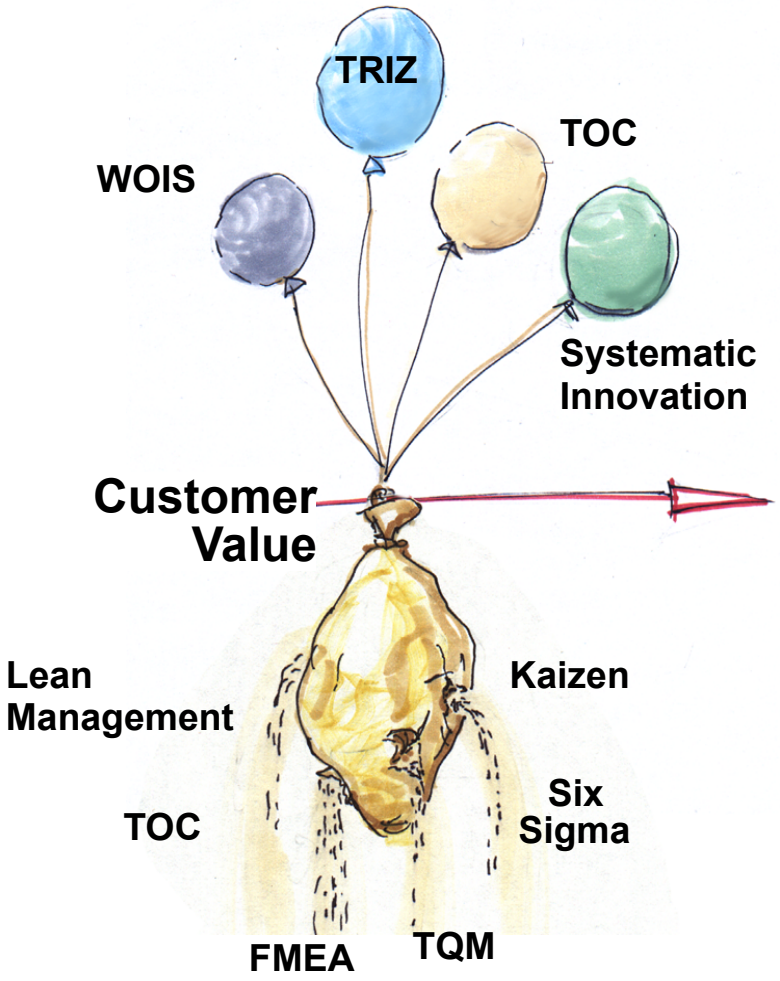
Production organisation



Product Innovations



Customer Value Increase



$$\frac{\text{Customer Benefits (Useful Functions)}}{\text{Costs + Harmful Functions}}$$

Innovation project

Project:	Innovation of hospital bed
Project duration:	6 months
Project team:	designer, production engineer, external consultant, logistic expert, process engineer, service, marketing, customer
Project inputs:	Target price, target markets, product life cycle, production volume
Project goals:	New product with higher customer value (new functions, better parameters, lower costs)

Project steps

1. Market analysis
- Customer requirements
- Analysis of competitors
- Development trends

2. Product analysis
- Structure
- Functions
- Parameters
- Costs

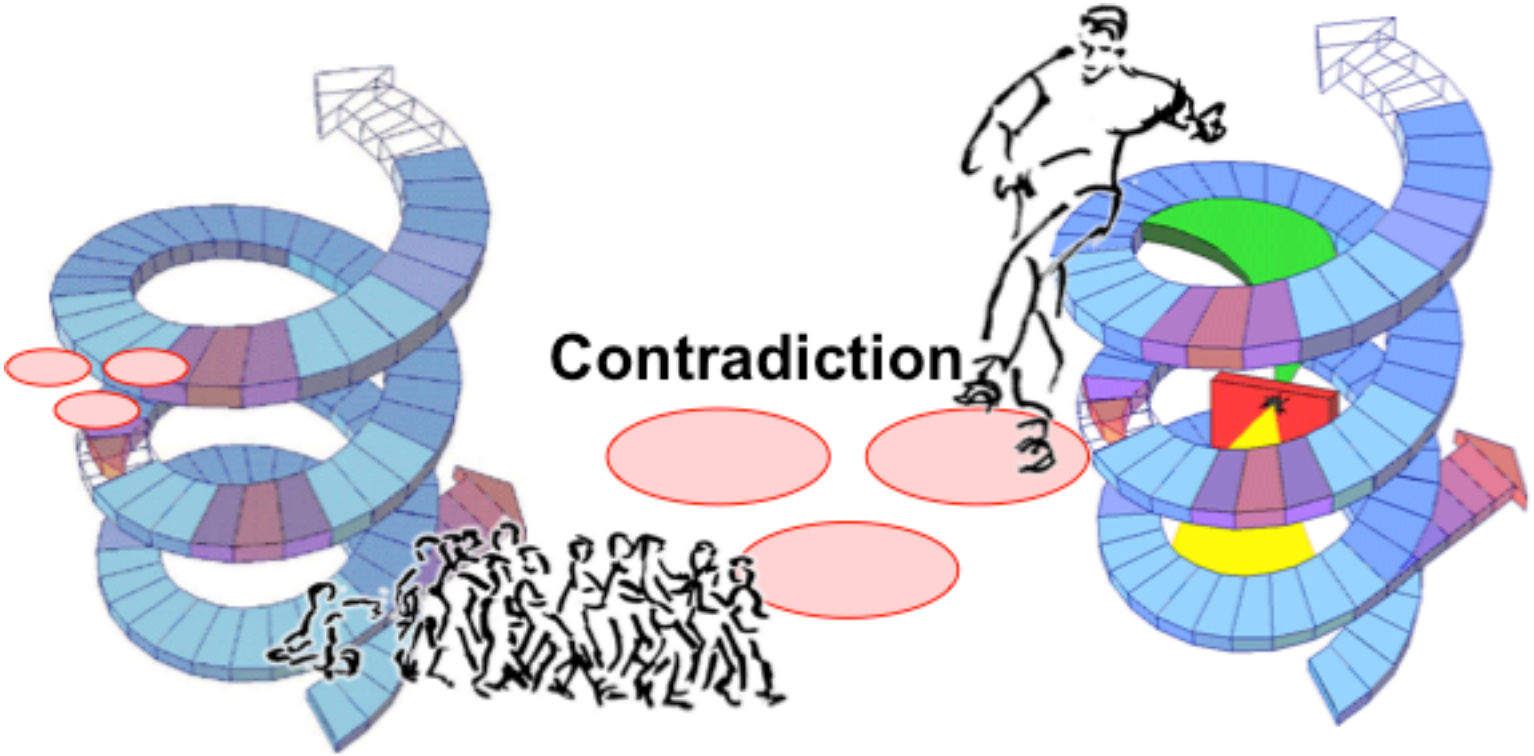
3. Innovation process
- Add required functions
- Eliminate not required functions
- Improve required parameters
- Solve contradictions

4. Implementation
- Product design
- Testing
- Production
- Marketing/ Sales
- Evaluation

Innovation bv WOIS

Benchmarking, Competition, Follow up Others, „Red Ocean“

...Breakthrough Innovations, Business Leadership, „Blue Ocean“



Source: H.Linde, WOIS

Contradiction solution - BMW

New solution
BMW and Krebsöge

One piece – tear up
No machining required, better connection quality

Contradiction

Goal I

⇧ **Connection Quality**

Goal II

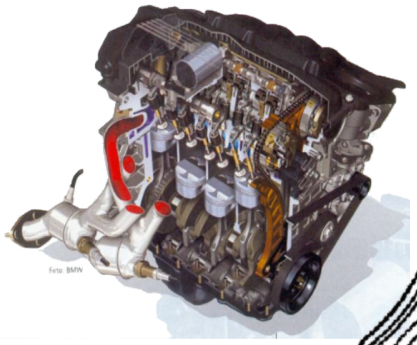
Machining Costs ⇩

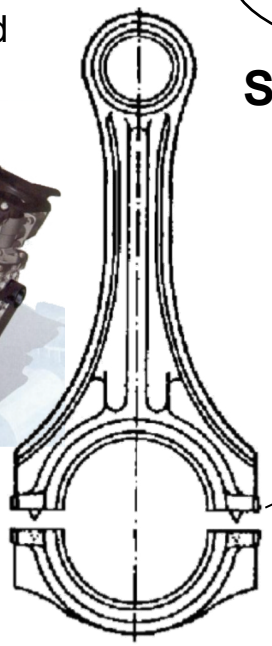
System Parameter

⇧ **No of machinng operations** ⇩

Old solution

Connecting rod





Expensive surface machining

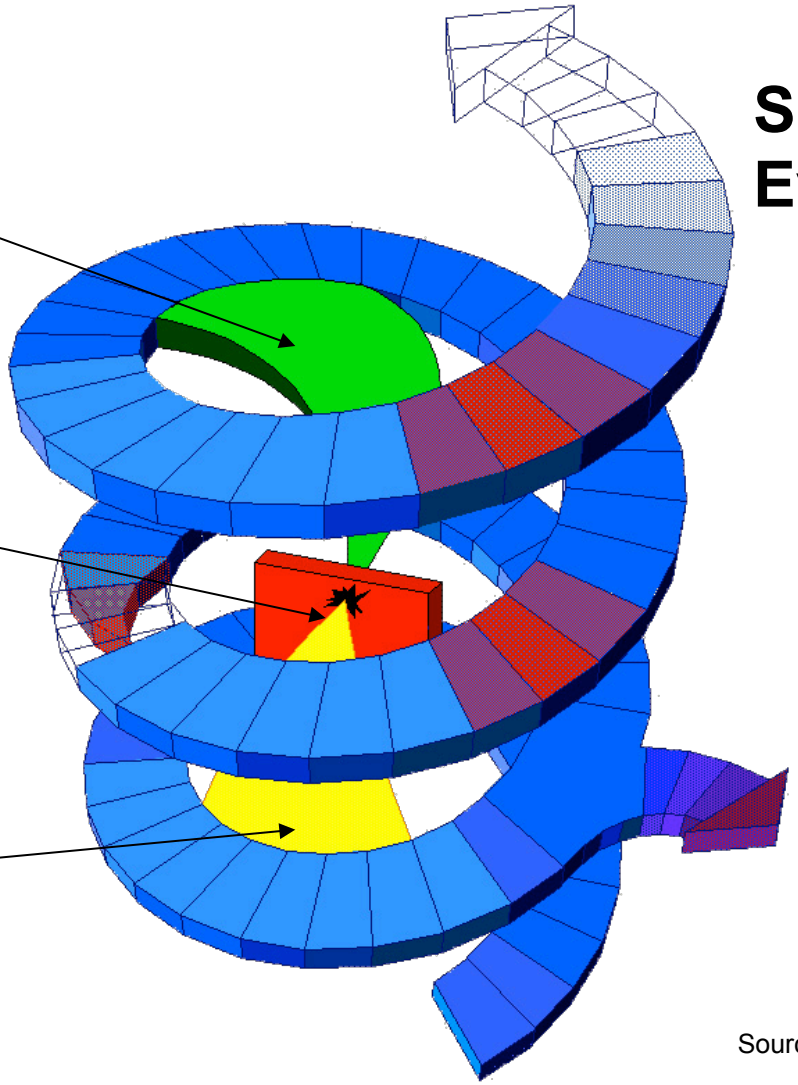
Source: H.Linde, WOIS

Contradiction based innovation strategy

New Solutions – Contradiction Solution Principles, Variation and Combination, Final Solution

Contradiction – Development Barrier

Orientation - Strategy, Trend Analysis, Current State Analysis, Evolution Trends, Ideal Solution

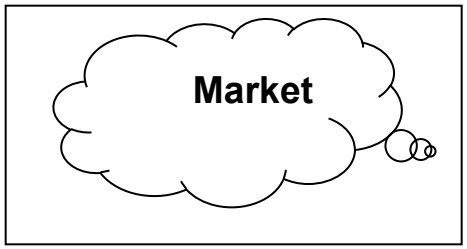


Spiral of Evolution

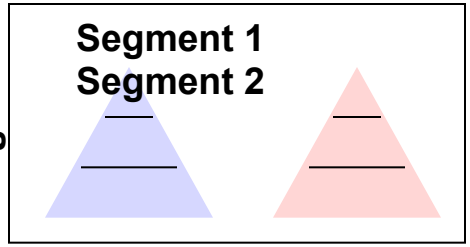
Source: H.Linde, WOIS

Orientation

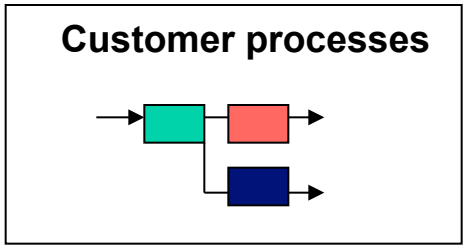
Market



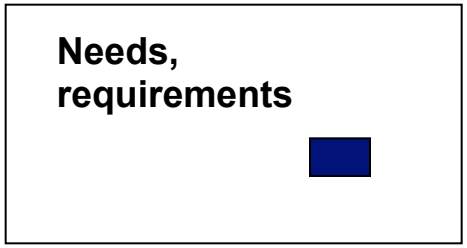
Segments



Customers

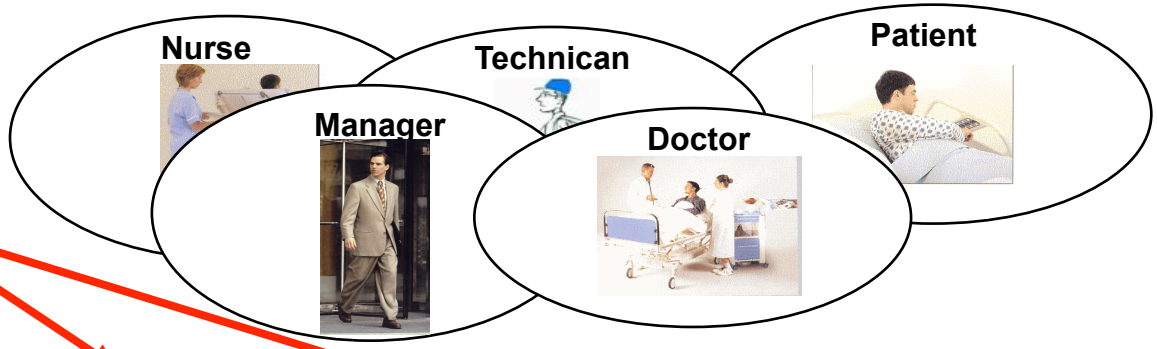


Needs



Segment - EU

	Thomas	Decket	Sabine	Ludger	T.Hartman	Belgium	Belgium	International	Netherlands	Kim	Netherlands	Priemer	Poradie
MOBILIZACE PACIENTA	5	5	5	4	5		5	5	5	5(5)	5	4,9	2
TRANSPORT PACIENTA	5	4	5	4	3		3	4	5	4(5)	4	4,1	9
REHABILITACE PACIENTA NA LŮŽKU	4	3	3	2	2outside of the bed		3	2	4	3(3)	3	2,9	15
HYGIENA PACIENTA	3	4	5	2	4		4	2	5	5(5)	3	3,7	12
KOMFORT PACIENTA	3	4	2	2	4		4	3	5 has control over movements, sorrouding	3(3)	5	3,5	13
BEZPEČNOST PACIENTA	5	5	5	5	5		5	5	5	5(5)	5	5,0	1
PŘÍSLUŠENSTVÍ	4	5	4	4	5		4	5	5	5(5)	5	4,6	5
OSTATNÍ MANIPULACE S PACIENTEM	3	3	4	4	4		5	5	4	5(4)	5	3,2	14
MANIPULACE S LŮŽKEM	5	5	4	4	5		5	5	5	5(4)	5	4,8	3
POLOHOVÁNÍ PACIENTA	5	4	4	4	4		5	5	4	4(4)	5	4,4	6
VZHLED LŮŽKA	4	4	2	3	5		4	5	4	4(4)	4	3,9	10
OVLÁDÁNÍ, ERGONOMIE	4	4	4	5	4		5	4	5	3(3)	4	4,2	8
HYGIENA LŮŽKA	4	5	5	4	5		5	5	4	4(4)	4	4,5	4
BEZPEČNOST SESTRY	4	4	5	3	4		4	5	5	4(4)	5	4,3	7
KOMPATIBILITA MATRACE, LŮŽKA A LŮŽKOVIN	4	3	4	3	3		4	5	4	4(4)	4	3,8	11
RYCHLÝ SERVIS,	5	5	4	4	5		4	5	4	4(4)	5	4,5	4



Processes

- O1= Handling with patient
- O2 = Handling with bed
- O3 = Transport
- O4 = Adjustment, setup
- O5= Connection with environment
- O6= Work with accessories
- O7= Ensuring safety
- O8= Mattress handling
- O9= Design-interaction with product

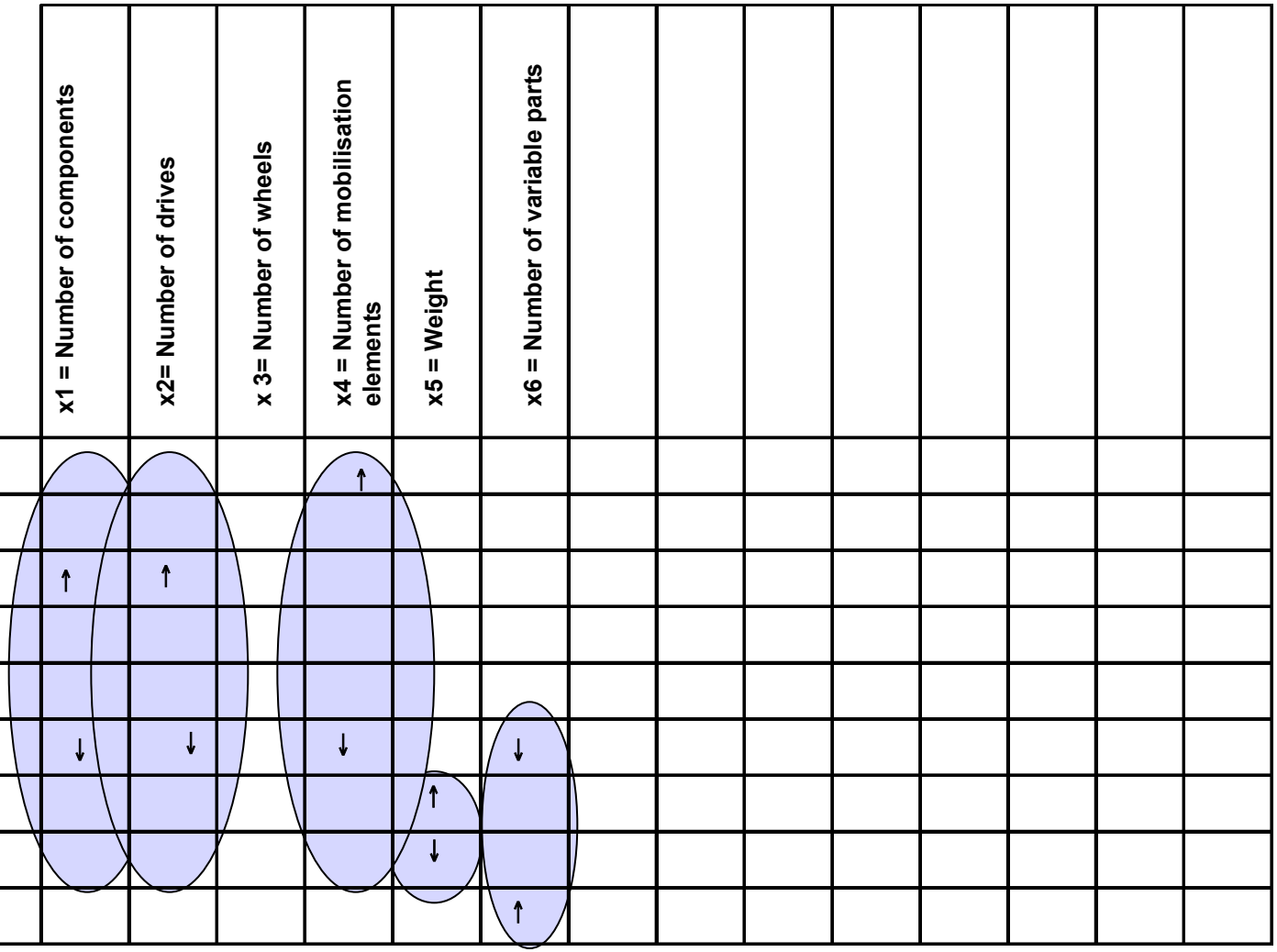
- O1= Handling with patient
- O11 = patient examination: CT, RTG
- O12 = moving patient onto other bed
- O13 = patient positioning
- O14 = turning patient
- O15 = patient mobilisation
- O16 = handling during urinate
- O17 = changing clothes
- O18 = patient hygiene
- O19 = eating
- O20 = re-dressing
- O21 = changing mattress
- O22 = changing bed clothes
- O23 = adjusting patient positions

Analysis of competitors

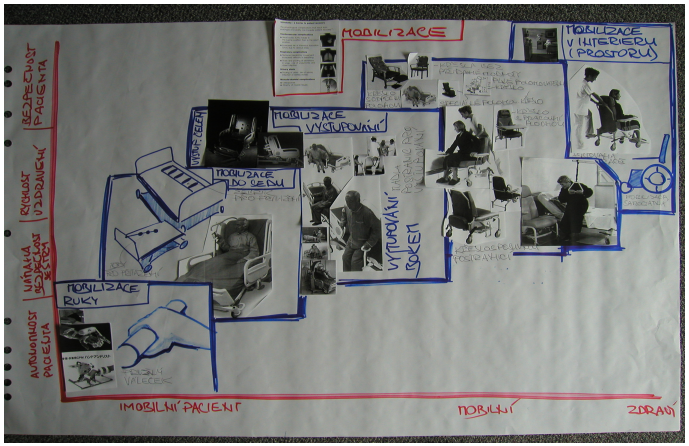
Interview with the customers – not right definition of the real requirements for the innovation process

When the customer can not exactly define what he wants, we had to understand his processes better – video analysis

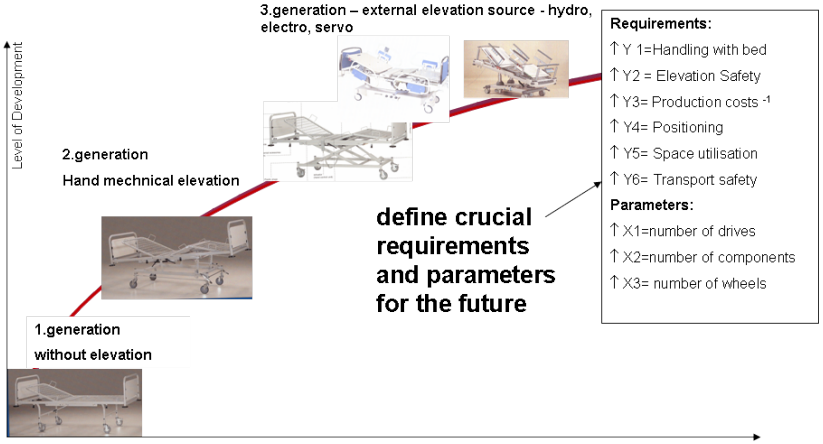
Contradiction matrix



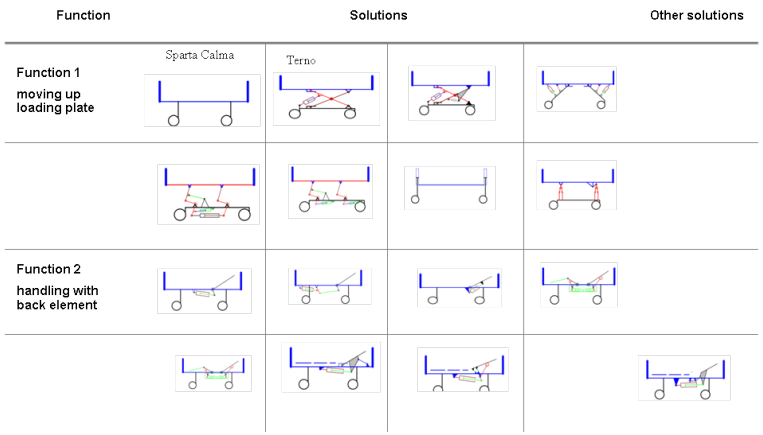
Ideas



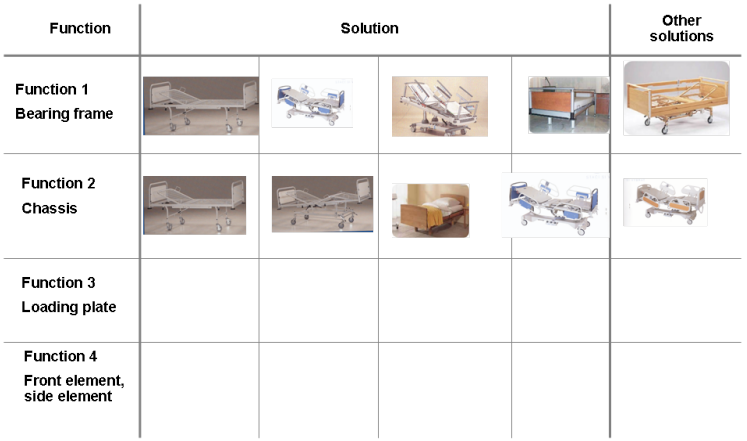
Product Evolution Trends



Kinematic analysis



Solution map



Fraunhofer IPA Slovakia LINET®

Number of Parts – 15 %

Number of Parts – 30 %

Results of the integration of product and process innovations

Eleganza De Luxe	2001	2005
Production Costs - €	1350	650
Time Standard	15	8

Eleganza Standard	2001	2005
Production Costs - €	1000	450
Time Standard	11	6,5

Handling mechanism	2001	2005
Production Costs - €	60	23
Time Standard	3	0,3

Lean Production
– Lean Workplace, visualisation, VSM, Pull, Kaizen, TPM, SMED, Manufacturing Cells, Team Work, Quality in Process, LCA

lean LINET

Lean Logistics
– SCM, Partnership with Suppliers, VSM, TPM, Standardisation, Kaizen, Quality in Process, Logistical Network Optimisation

Knowledge Management and Development of Corporate Culture
- Continuous Development and Visualisation of Knowledge
- Non Blaming Culture
- People Involvement
- Continuous Improvement

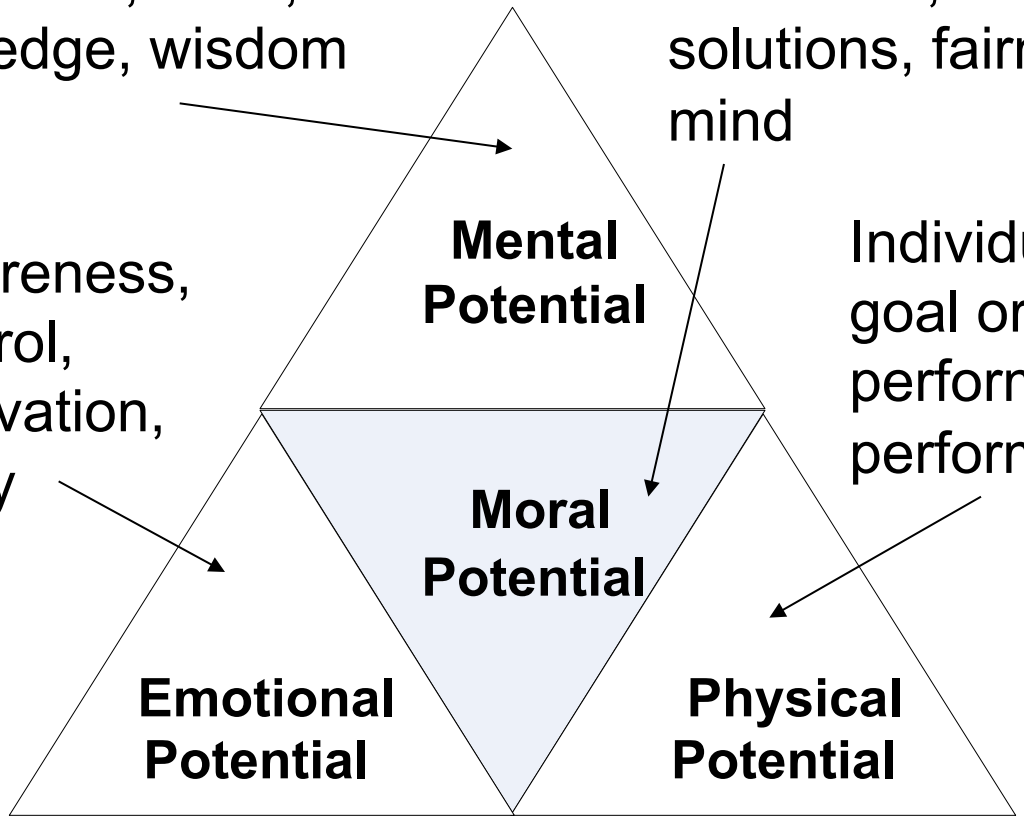
Lean Office – 5S, Time and Meeting Management, VSM, Quality in Process, Kaizen, Standardisation and Visualisation, Team Work

Lean Product Development
– Set Based Thinking, VSM, DFMA, VA, Project Management, Team Work and Simultaneous Engineering, Quality and Visualisation, Kaizen

Measurement and Development of Human Potential

Information, experience, skills, knowledge, wisdom

Discipline, keeping standards, win – win conflict solutions, fairness, ethical mind



Selfawareness, selfcontrol, selfmotivation, empathy

Individual performance, goal orientation, team performance, corporate performance, leadership

Summary – IE Implementation in Linet

1. 1990 – 1993 – Building production program and production system
2. 1993 – 1995 – Basic IE methods, stabilisation and standardisation
3. 1995 – 2000 – New manufacturing system - lean
4. 2000 – 2005 – Innovations, integrated product/ process development, logistics
5. 2005 - 2007 – Knowledge management
6. Future – international growth, modular manufacturing system

Our most difficult dilemmas

1. Management of company growth versus IE and lean implementation
2. Productivity versus innovation ability
3. Productivity versus flexibility
4. Flexibility versus stability
5. Discipline versus entrepreneurship and creativity of employees

Current problems

1. How to reach and keep the best talents and individuals?
2. How to share, communicate and develop the best corporate practices in the organisation?
3. How to transfer knowledge between employees on the projects and actions in the company?
4. How to increase and measure knowledge?
5. How to change knowledge into innovation as fast as possible?

Export in 73 countries

Summary

- Starting capital: 15 Tsd. USD
- Turnover: 70 mil. Euro
- Average annual return of capital 63%
- EBIT 25%
- Capital growth 800 x
- 320 employees
- Added value per employee: above 60 Tsd. USD
- Export: 73 countries

Paradigm changes

	Yesterday	Tomorrow
Corporate strategy	Productivity	Innovation
Corporate processes	Standardisation	Improvement
Change management focus	Best practices, benchmarking, increase customer value	New Practices – Blue Ocean, create new customer value
Employees	Focus on the “empolyee´s muscles” (peformance – physical intelligence) and brains (kaizen – mental intelligence)	Focus on the employee´s heart (self motivation, emotional intelligence) and soul (moral and ethics – soul intelligence)
Competitive factors	Hardware, software	Brainware, co-ware
Corporate culture	No mistake and error culture	Culture of trials and experiments
Intercorporate relationships	Competition, fight	Co-operation, partnership
Improvement concepts	Lean Manufacturing, Six Sigma, TOC	Systematic Innovation, Lean Product Development
Innovation focus	Product and Process innovation	Business and Thinking Innovation
Management focus	Quality, Productivity, Flexibility	Innovation and Knowledge Management
Management principles	Management by objectives, process and project management	Management by opportunities, company as a living organism

Thank you for your attention

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