# *The Learning Factory as a Concept for improvement of training and research in production*

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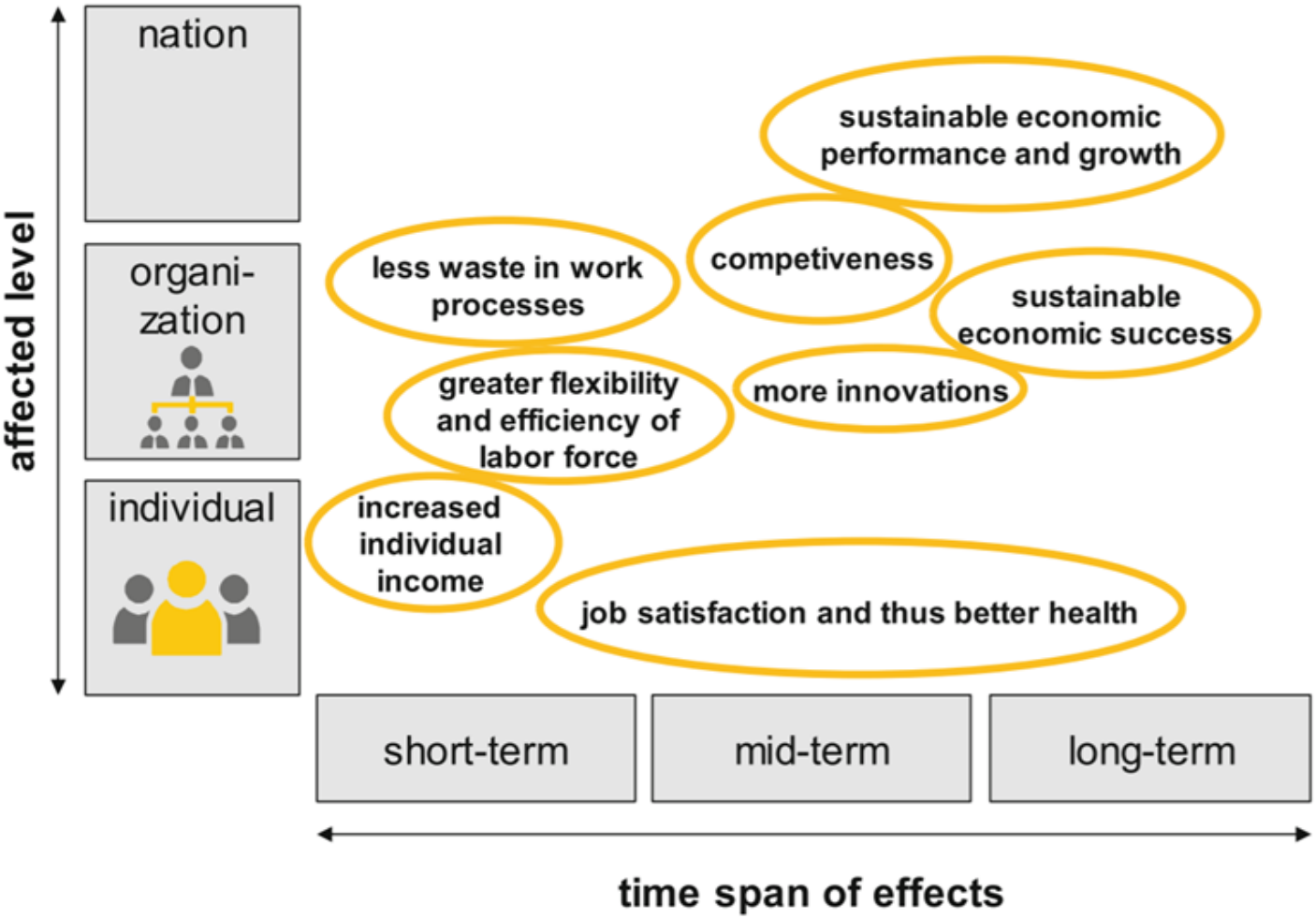
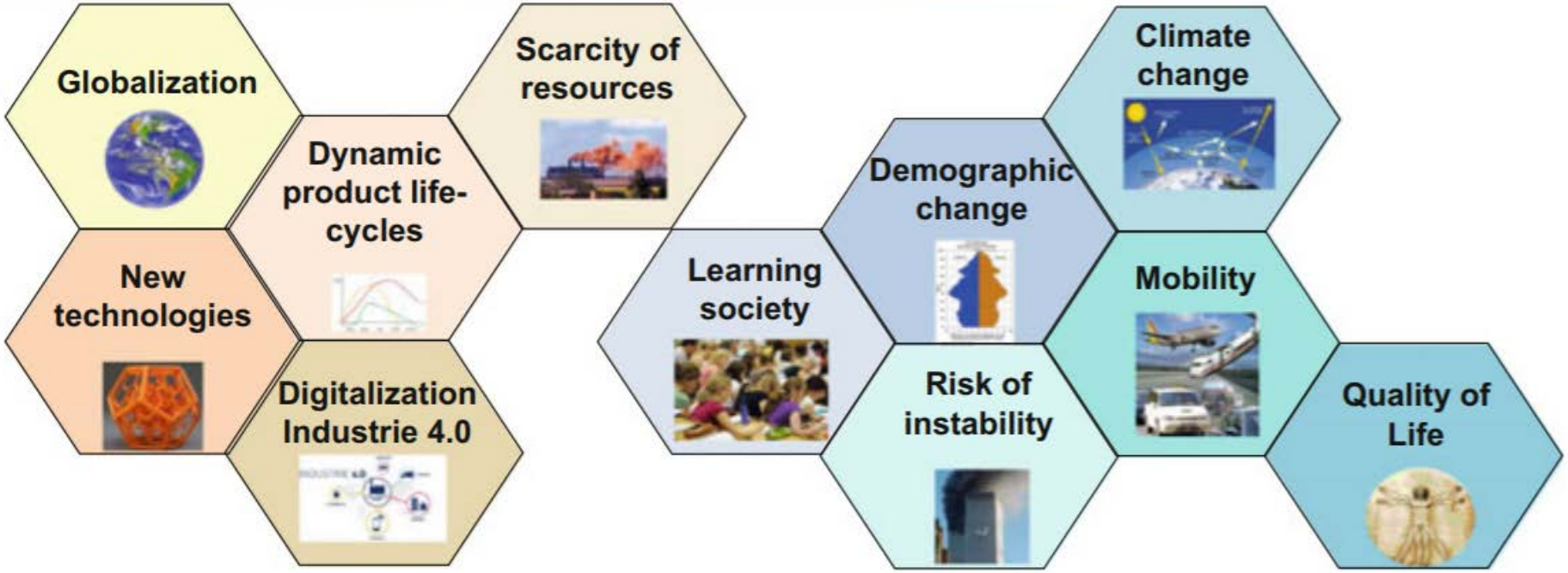
# Effects of education and training on national, organizational, and individual level



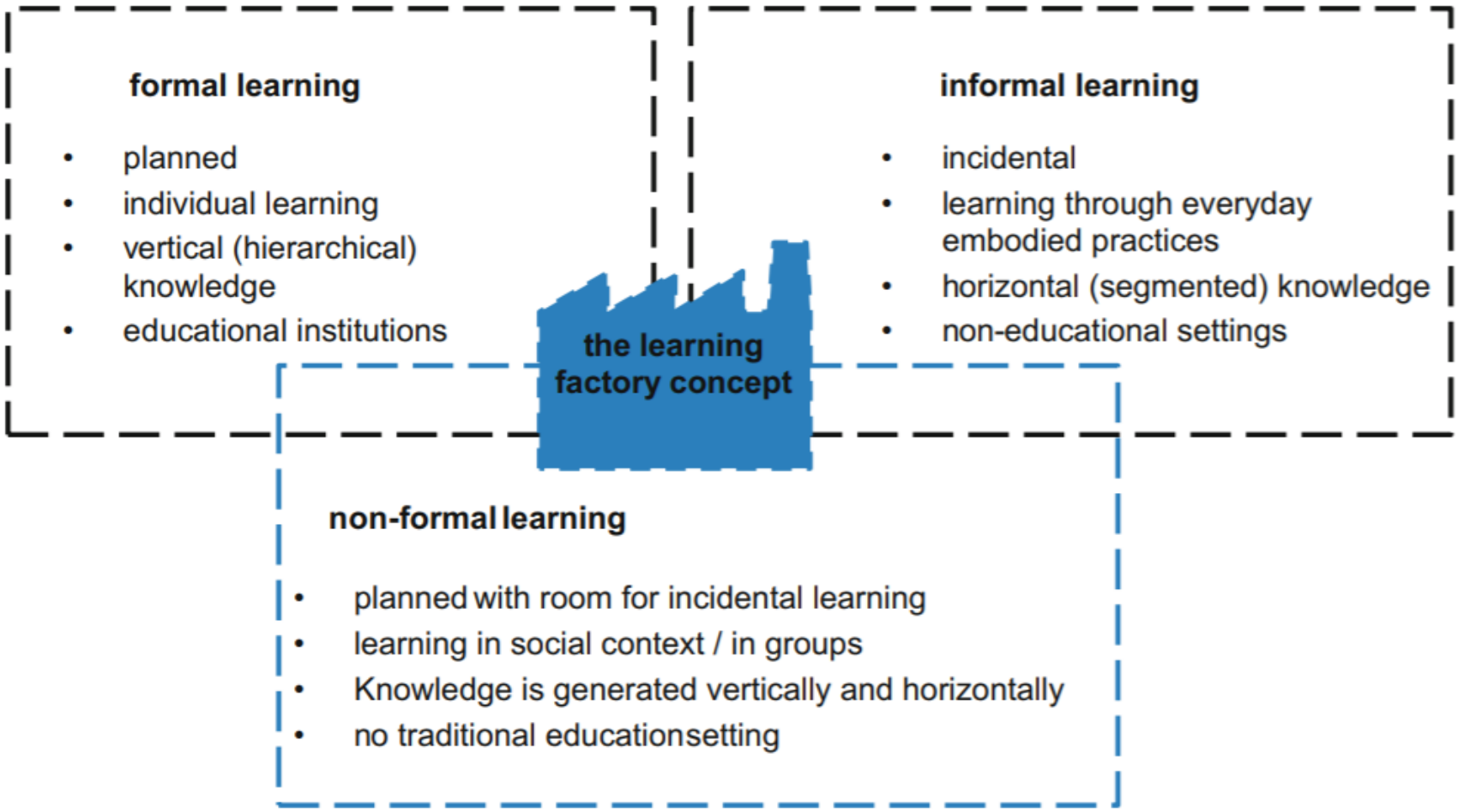
# Megatrends with crucial importance for production and products

**Conditions for production**
How is produced?

**New requirements**
What is produced?



# Learning factory concept between formal and informal learning



# Didactic concept of the learning factory

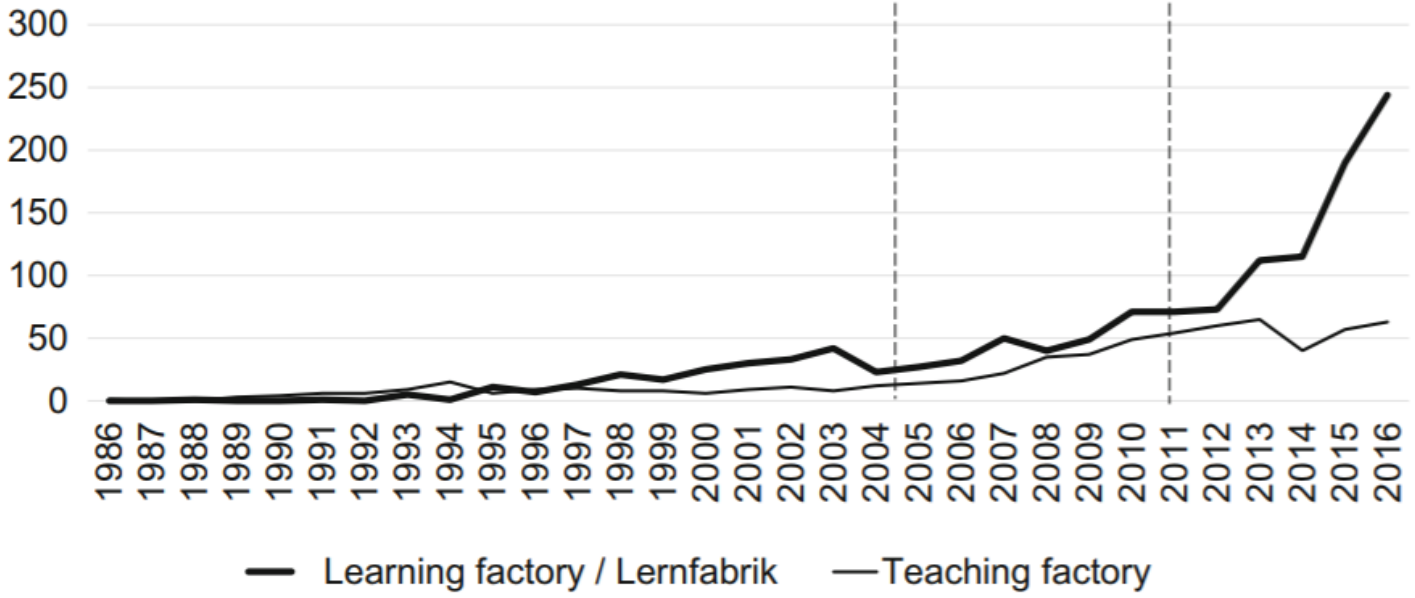
| | Theoretical Input | Experience by Practical application | Transfer to the real environment |
|---|---|---|---|
| |  |  |  |
| | Knowledge transfer/ information | Group work / practical exercise / simulation | Go&See/ On site prototyping |
| Learning effect | | | |
| Rate of recollection after 3 weeks | 70 % | 72 % | 85 % |
| Rate of recollection after 3 months | 10 % | 32 % | 65 % |

# Historical development of learning factory approaches and the number of indexed documents on Google Scholar regarding learning and teaching factories

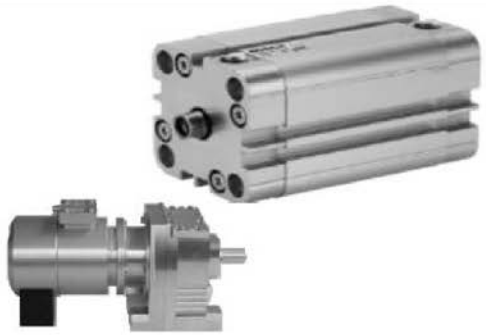
**1st wave of singlelearningfactories**
1988: CIM learningfactoryin Stuttgart
1994: The term „learning factory“ is used by Penn State University in the US
2000: Teaching factory concept in the US

**2nd LF wave**
From 2005: Built-up of local LF pre-dominantely in Europe

**Networking & scientific consideration**
2011-2017: IELF
2013-2016: NIL
2014-2016: CIRP CWG
From2017: IALF



# TU Darmstadt Learning Factory
# Purpose: training for industry, education, research



## Realistic Environment

- 500 m² space
- 2 machining lines with 9 machine tools
- 2 assembly lines
- Cleaning and QA
- Shopfloor-Management
- Learning-cells

## Real Products

- Pneumatic cylinder (entire value stream incl. production planning process)
- Gear motor (high-variant assembly)

## Educational Offers

Lean (15 existing workshops, 27 days of training)

dual use

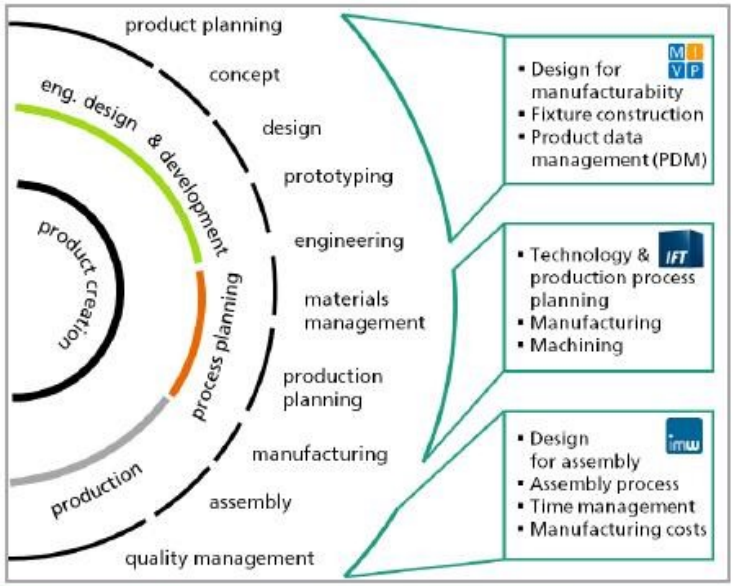
„Industrie 4.0“

ALSTOM B/S/H/ Continental CONTTEK Kontakttechnik - Baugruppen DAW FRESENIUS MEDICAL CARE Freudenberg habasit HBM Johnson Controls

Linde Mahr MERCK mpdv Q-DAS Rexroth Bosch Group RINGSPANN ROSS RJN SEW EURODRIVE schweizer WOM

# Learning Factory, TU Vienna

Learning & Innovation Factory for Integrative Production Education




# Learning Factory TU Stuttgart

# ESB Logistics-Learning-Factory

## Holistic Approach from Product to Factory

ESB
LOGISTIK-LERN-FABRIK

Customization of adaptable product (high variance)

Process Design & Validation

Assembly and intralogistics systems, Jigs & Fixtures Design & Realization

System realization and ramp-up



Creativity & Methods Competence for systematic Idea & Innovation Mgmt.

Integrated Product and Process Planning and Design Competence

Systems and Interface Competence

Education | Training | Research | Industry Projects

ESB BUSINESS SCHOOL

TU WIEN TECHNISCHE UNIVERSITÄT WIEN Vienna University of Technology

Fraunhofer AUSTRIA

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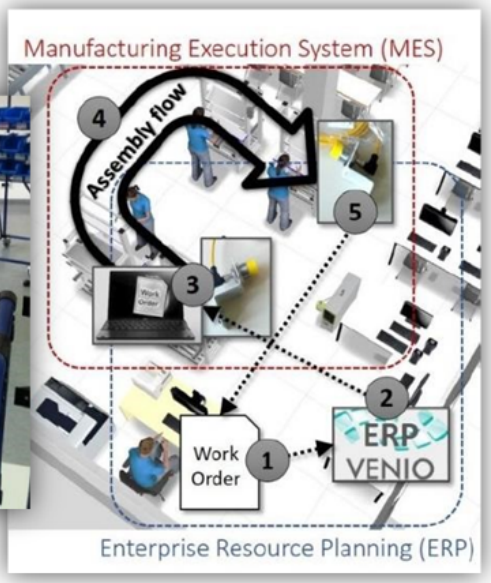
# Learning Factory RWTH - WZL Aachen


# Learning Factory FESB Split

**Sveučilište u Splitu**
**Katedra za industrijsko inženjerstvo**

## Operativno stanje 2017/18

- 8 znanstvenika (1 ERASMUS+ PhD student)
- 1 laborant
- Više od 20 dana seminara
- Obrazovano je više od 50 zaposlenika
- Obrazovano je više od 100 studenata




## Razvoj 2017/18

- Seminari (TPS and Lean Management, Lean Project Management, KATA, Hoshin Kanri, Value Stream Mapping, Kaizen)
- Kooperacija s industrijom (FEAL, Končar Električni transformatori,...)
- Novi moduli za trening Module (Design for Assembly)
- Inovativno pametno poduzeće (INSENT) – istraživački projekt, Hrvatska zaklada za znanost
- Network of Innovative Learning Factories NIL, DAAD Project
- Istraživački i razvojni centar (Siemens PLM, VisTABLE, 3D skener i 3D printer)
- Inteligentna montažna linija s robotom

## Značajnije prezentacije 2017/18

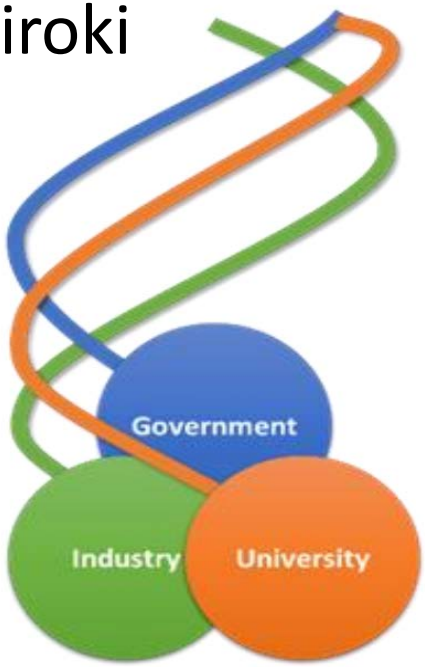
- Prezentacije na konferencijama (Seul, Kairo, Patras, Jeruzalem, Novi Sad, Izmir i dr.)
- 7th Conference on Green and Lean Production, Zagreb, 2017
- 5nd seminar Pametna proizvodnja, Split, 2018

# Learning Factory on FSRE

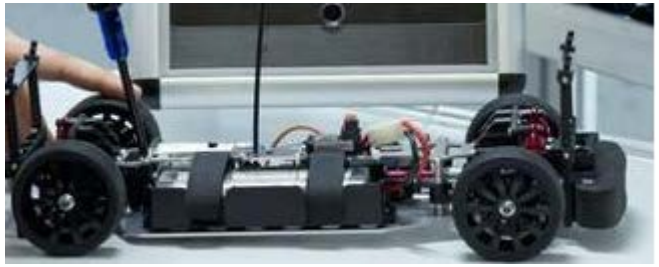
- The initiative of development of Learning Factory on FSRE has started in January, 2018
- Project: "*Increasing Competitiveness of Small and Medium Enterprises through Creating Business Associations and Establishing a Learning Factory*"

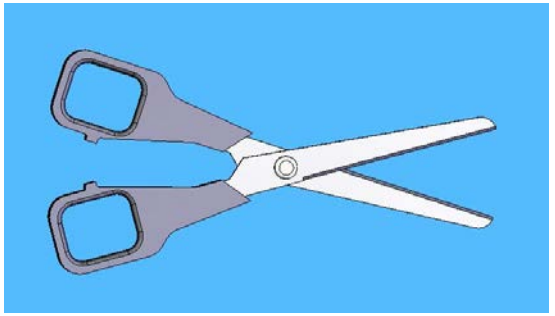
# Learning Factory on FSRE - partners

9 local metal and plastic companies, city of Široki Brijeg and Posušje municipality.



# Potetntial product in LF





# *Selected product in LF*

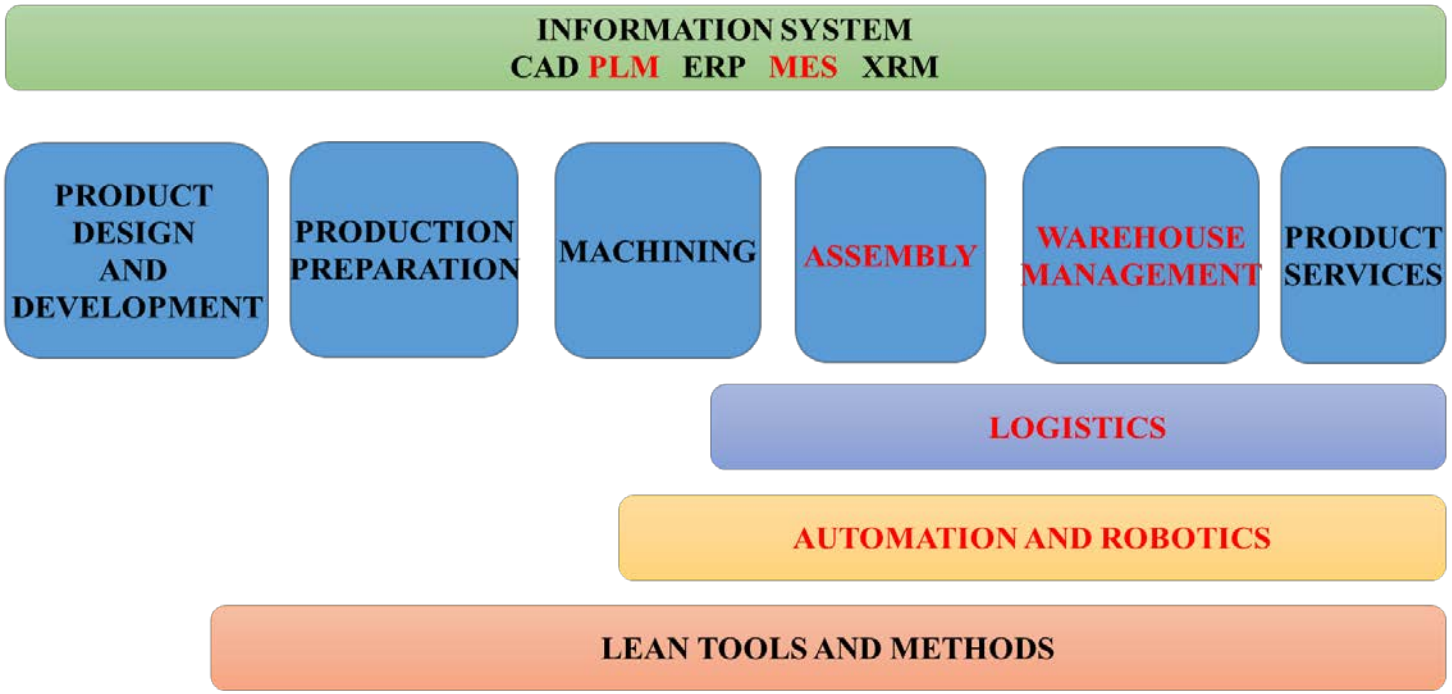
CONSTRUCTION VARIABILITY

TIP B/M: 600 x 300 mm

TIP B/M: 750 x 450 mm

TIP B/M: 900 x 600 mm

# FSRE Learning Factory structure



# *Initial state*

- Faculty have a part of infrastructure
- partially developed the infrastructure from the lean management

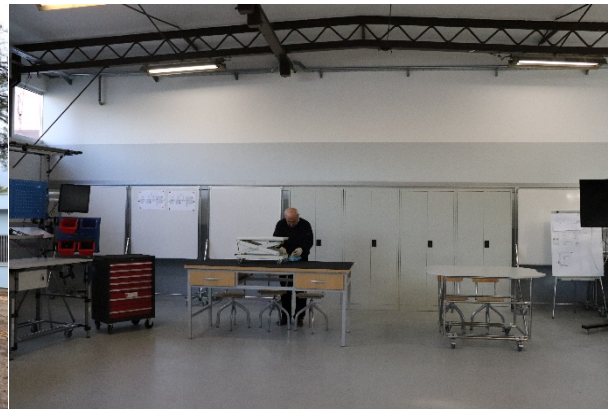
# Initial space and equipment

- About 200 m2 of area
- Old machines and tools

# *Initial state*

# Current state



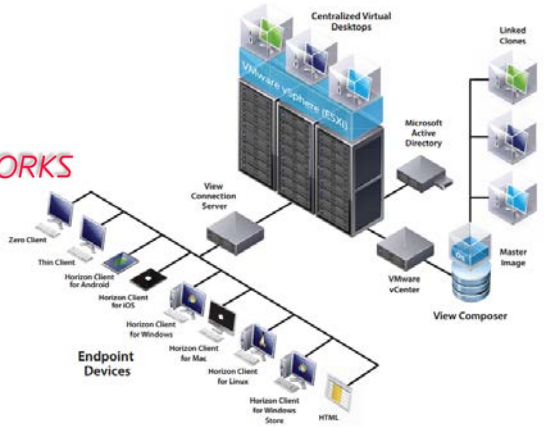


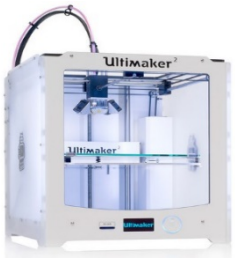

# Current state

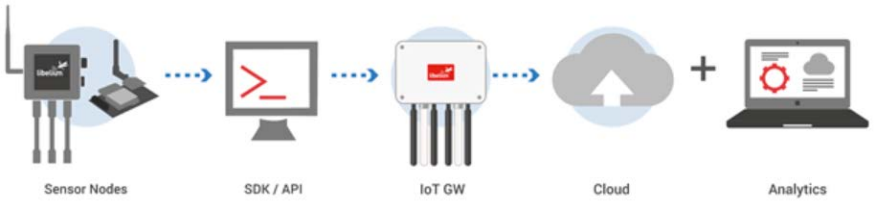
SAP Business One

SOLIDWORKS

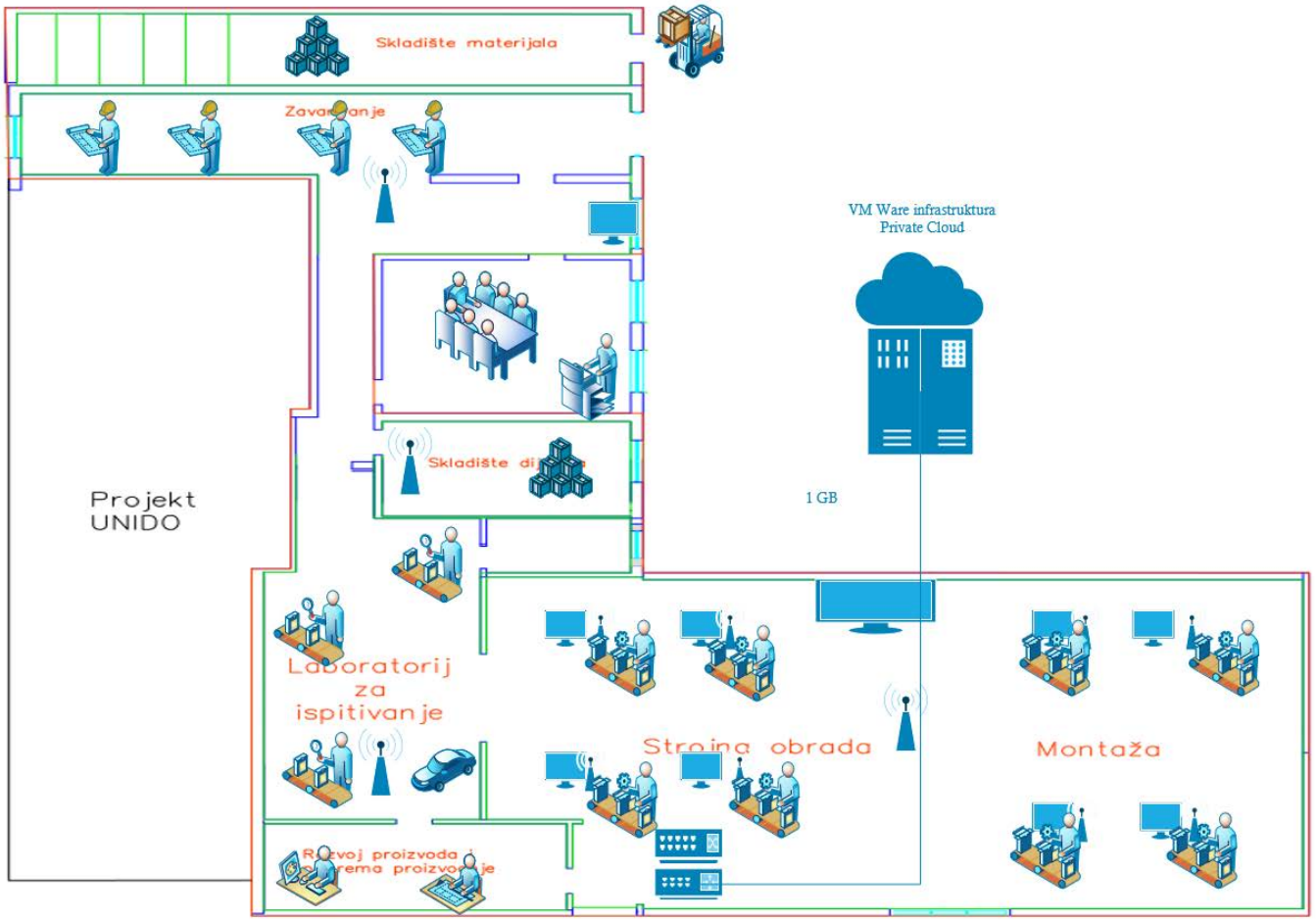
CAS genesisWorld




# Future state
# Layout LF(cca 500 mq) and hardware infrastrukture



# *Future state*

# Focus areas

participants

students

managers, works councils

shop floor employees

products

LF FSRE

contract manufacturing

for companies

environment

topics

resource efficiency

Industrie 4.0

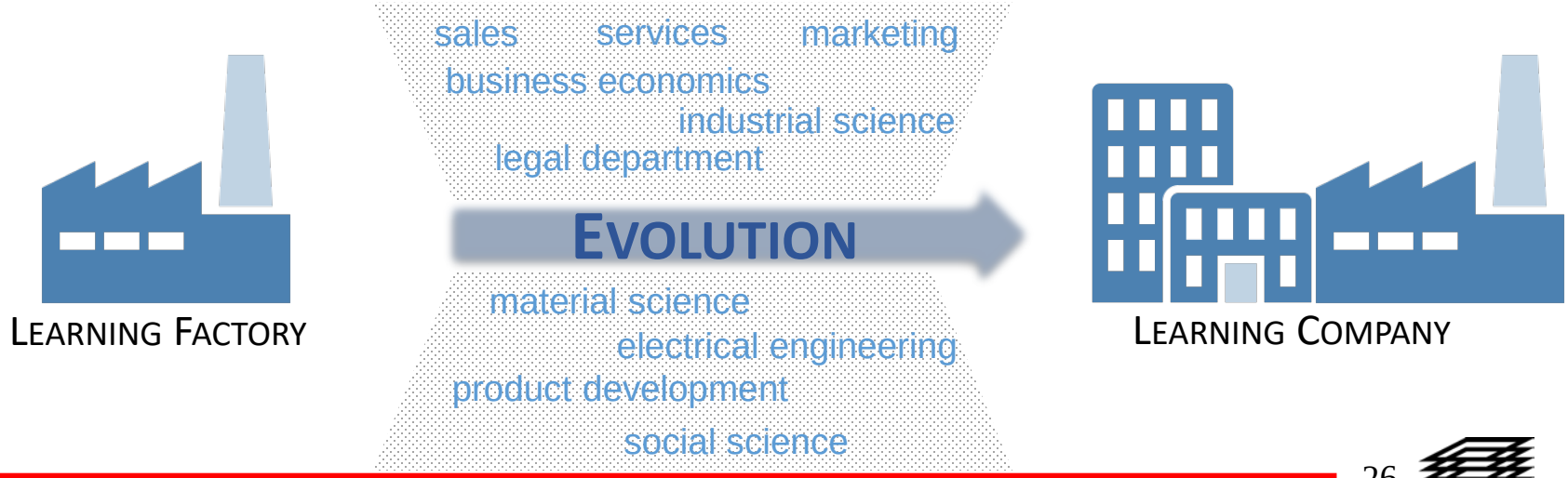
process optimization

management and organization

Product design

# *Future development of the FSRE Learning Factory*

- Develop new product and its process
- Purchase and instalation of new equipment
- Integration of more and more faculties department
- The objective is a Learning Company that includes all departments of a company



# *THANK YOU FOR YOUR ATTENTION!*

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