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# Future Directions in Engineering Education and Research in Silesia



**1. General Perspective**  
Measures & Challenges



**2. Silesia Case Study**



Why we need engineers ?

2



1



4



3



6

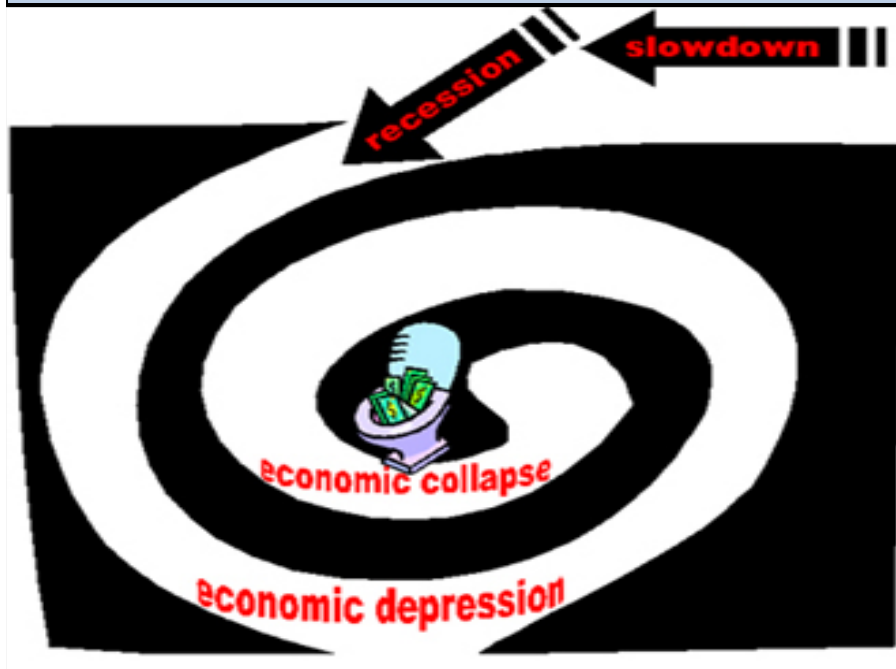


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1. General Perspective

# Future Directions in Engineering Education and Research under Current Economic Downturn



# Future Directions in Engineering Education and Research under Attracting Young People to EE Problem



# Academia & Its Mission

Academia = Faculty + Students



Education



Educators

Science



Inventors  
Scientist

R&D

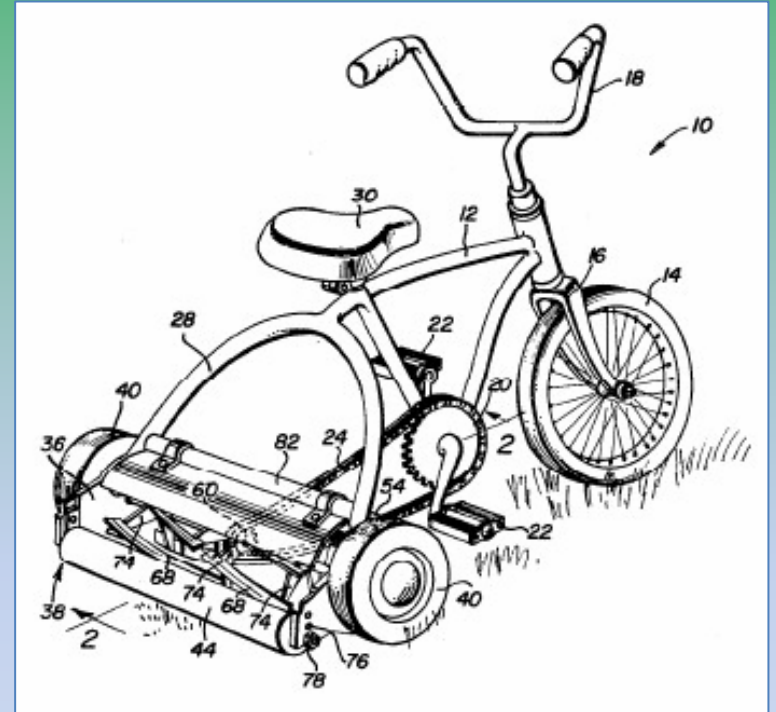


Innovators  
Entrepreneurs

# Mandatory Measures

- **Invention & Innovation**

transformation  
entrepreneurship  
new challenges  
promotion



- **Internationalization & Mobility**

in **Cooperation with**

Sister Universities – joint networks

Industry – technology transfer

Policymakers – framework programs

- **Local Partners**



# Invention & Innovation

## 1. Techno-parks



## R&D Centers

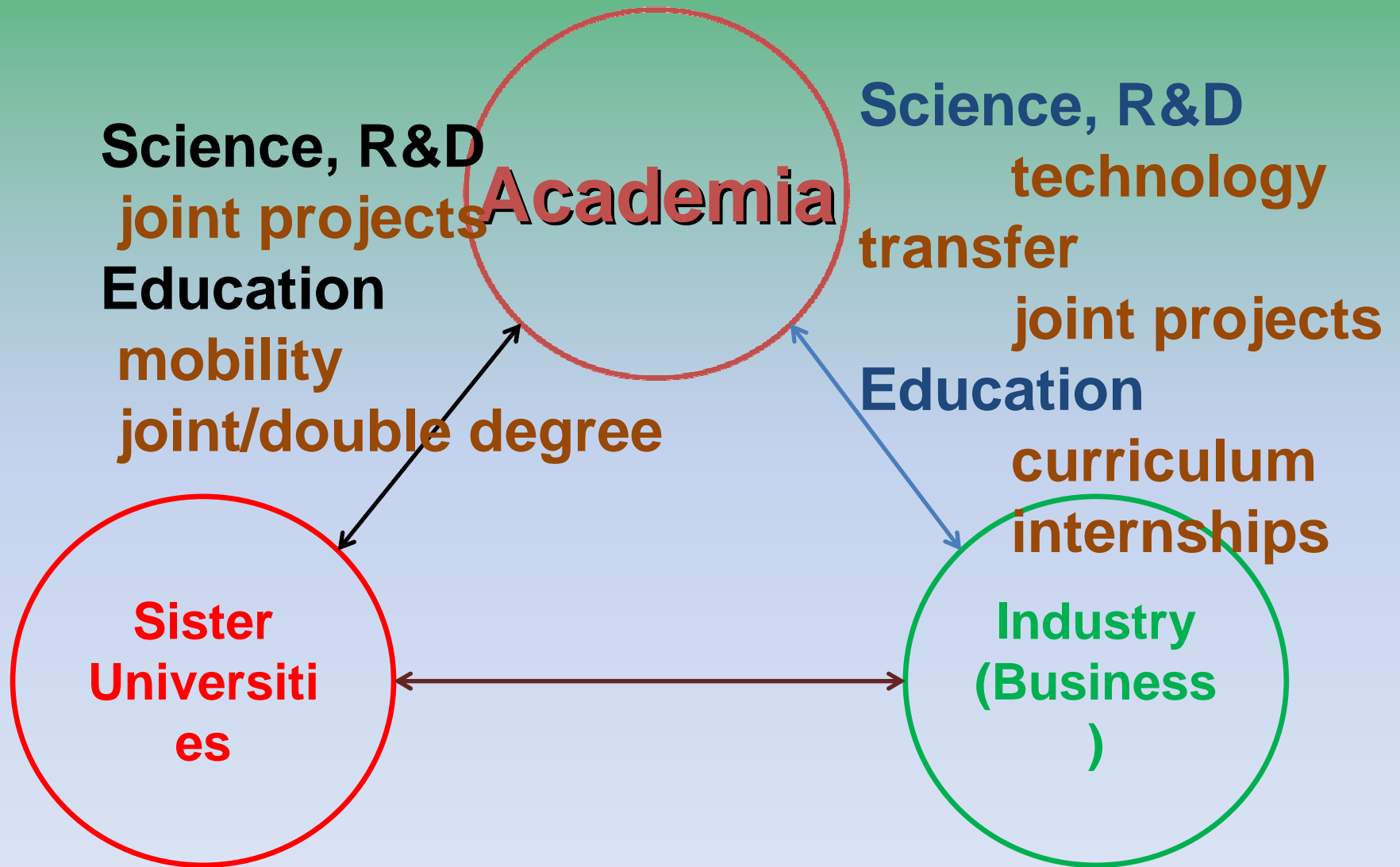


## 2. Incubators of Entrepreneurship



## 3. Schools of start-uppers

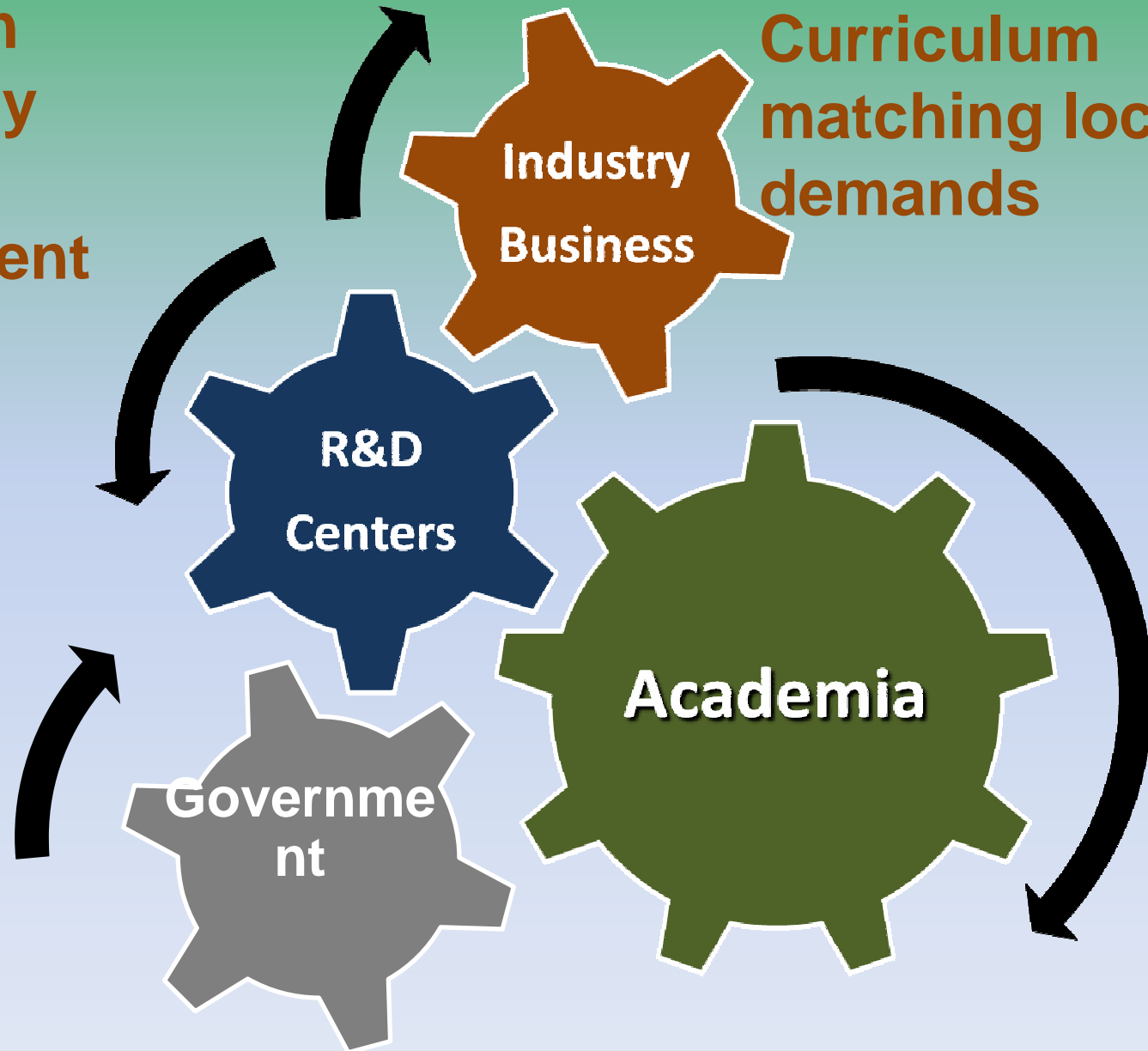
# Internationalization + Cooperation



# Cooperation with Local Partners

Innovation  
technology  
transfer &  
development

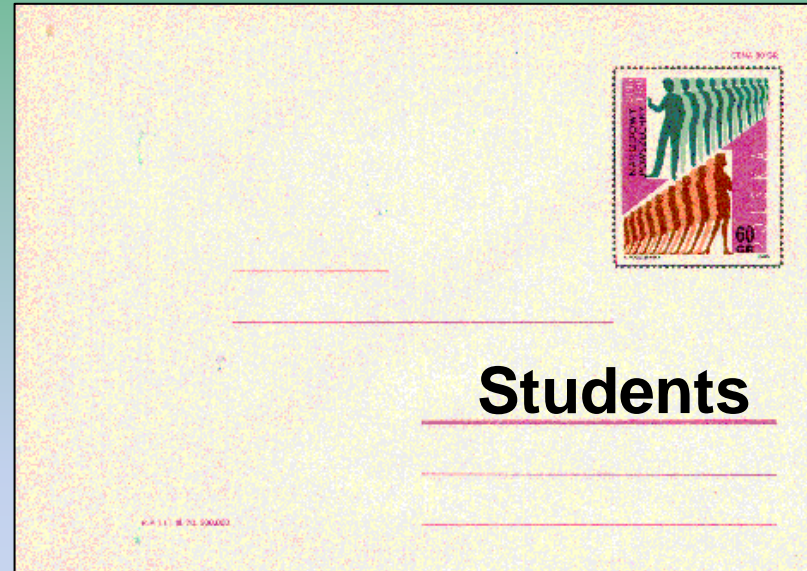
Curriculum  
matching local  
demands





# Challenges of Global Learning Revolution

- Addresses of Knowledge
- Learning Methodology



# Addresses of Knowledge

## degree-driven activity



### International Students

2 million students study abroad  
1 mln Asian, 0,5 mln European,  
0,2 mln US natives

## LifeLong Learning (LLL) pursuit



### Students not seeking degree

Teenage students (scholars)  
Mature students (senior citizens)

## degree-driven activity

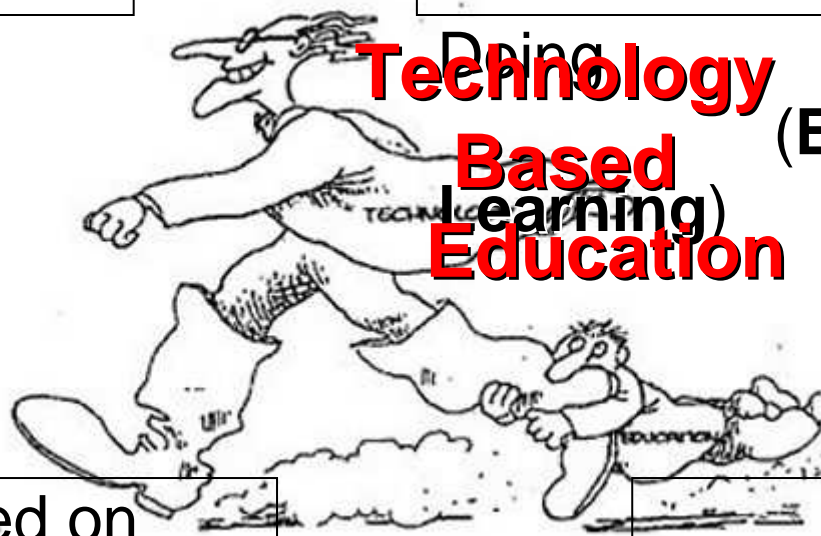


### Home Students

# Learning Methodology

course **content driven**  
by market demands

students migrate towards  
self-directed learning  
experiences  
Learning-by-Reading/Watching  
Learning-by-

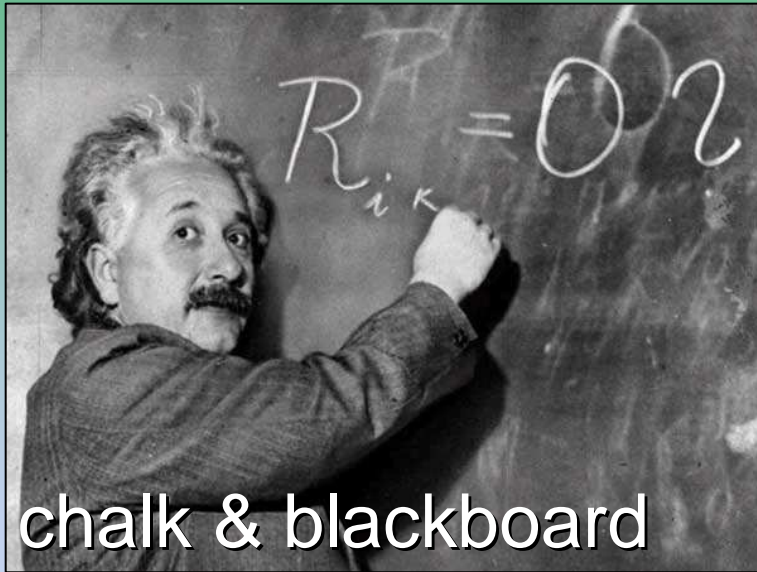


strong impact placed on  
**Collaborative Learning**

Project Based Learning  
(PjBL)

teaching how to deal  
with engineering  
problems,  
also how to **become an**

# TBE + Collaborative Learning



chalk & blackboard

TBE



blended, web-based



trad class

Collaborative Learning



PJBL, PBL

# Challenges of Global Technology Revolution, Environmental Change

global warming, shrinking natural resources, ...

***Positive proof of global warming.***



**18th  
Century**

**1900**

**1950**

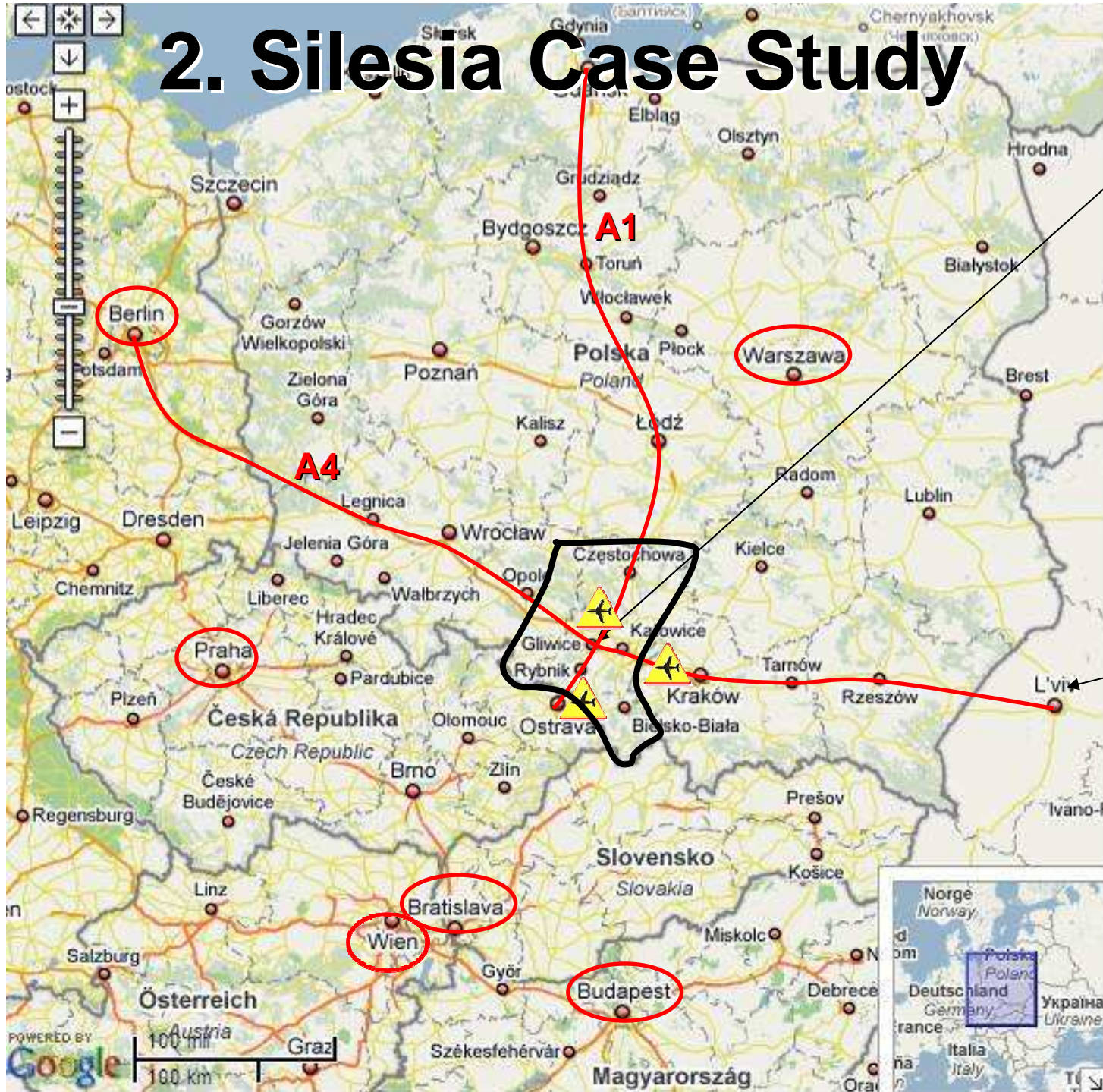
**1970**

**1980**

**1990**

**2006**

# 2. Silesia Case Study



- Gliwice (HUB)
- Katowice: 30 km
- Ostrava: 60 km
- Krakow: 100 km
- Wroclaw: 150 km
- Warsaw: 300 km**
- Berlin: 500 km**
- Lviv: 450 km
- Prague: 350 km**
- Bratislava: 300 km**
- Wien: 300 km**
- Budapest: 350 km**

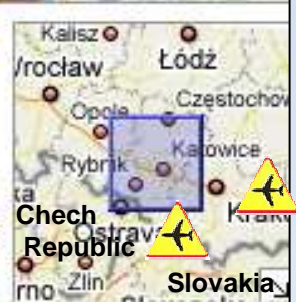


**Voivodeship**  
highly urbanized  
and  
industrialized  
region  
area: 12.300 km<sup>2</sup>  
population: 4.7 M  
density: 400/km<sup>2</sup>  
68 towns & cities



**Metropolis**  
14 cities  
population: 2 M

Czech Republic



# Education, general data

- 150 000 university students
- 30 000 university graduates in 2009 = 1/3 of Poland
- **Public Universities:** 115 000 students (95 000 in Metropolis)

1. Silesian University of Technology (SUT)		(27 000)
2. University of Silesia in Katowice		(40 000)
3. University of Economics in Katowice		(16 000)
4. Medical University of Silesia		(6 500)
5. Academy of Physical Education in Katowice		(5 000)
6. Academy of Music in Katowice		(1 000)
7. Academy of Fine Arts in Katowice		(500)
8. Częstochowa University of Technology		
9. University of Bielsko Biała		

create **Consortium of Public Universities in Silesia:**

- **promotion**
- **internationalization & mobility**
- **LLL**



# Engineering Education, SUT

- New, high-tech oriented fields of study  
Biotechnology, Biomedical Engineering, ...
- Study in English programs
- Technology Based Education, based on Moodle LMS

traditional (f2f) form → blended form (f2f + ICT)

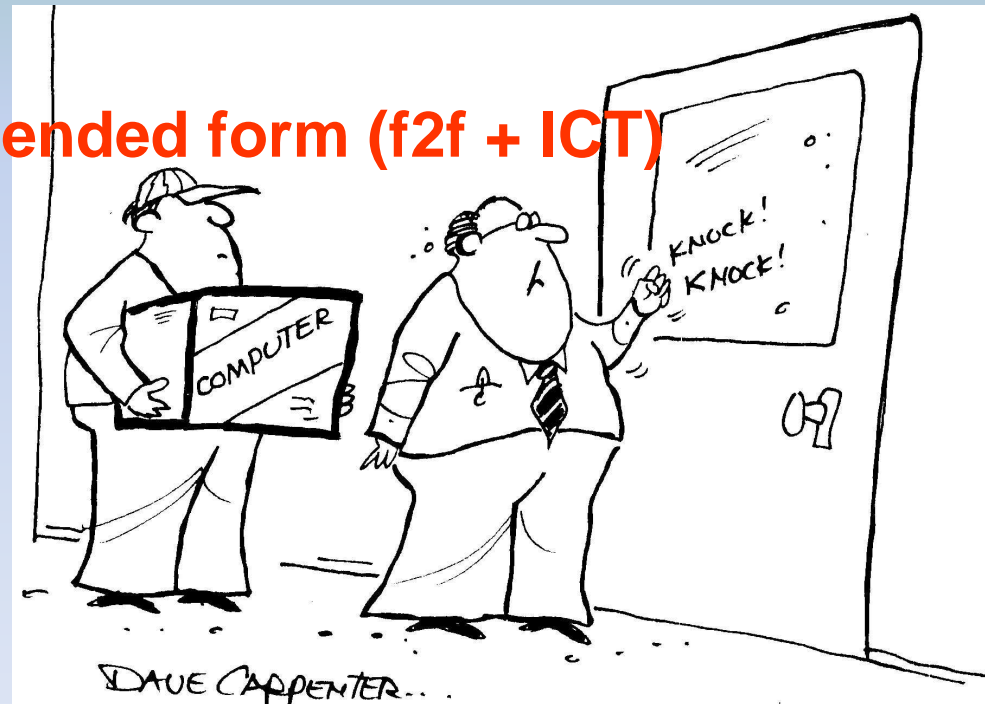
- PjBL, PBL programs
- LLL programs

to **enhance Quality**

promote EE

develop Mobility

match Industry Demand



"Open up Clayton, you knew it was inevitable."

# LLL, attracting young people to EE



Silesian Children University

Silesian Third Age University

to be organized, within the Consortium framework,



in 2011



~60 individual events:  
shows, lectures,  
happenings  
in Gliwice and  
Katowice

Next Editions of Silesian  
Researchers Night  
to come

Silesian  
Science Center

to be organized,  
as a joint venture  
of all regional stakeholders,  
till 2014

# SUI International Cooperation - Universities

- ❑ **EU Programs (Erasmus -146 Univ.)**
- ❑ **Cooperation Agreements (MOUs)**



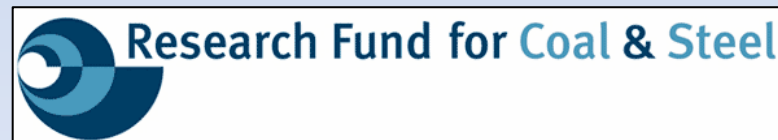
- mobility
- double/joint degrees



- joint R&D projects



- 7th Framework Programme
- Coal & Steel Programme



- other programs

# SOT International Cooperation - Industry

1. Internships & Scholarships
2. BSc/MSc Projects
3. Partner-oriented Courses,  
Train

Rockwell  
Automation

DisplayLink

DELPHI  
FUJIFILM

CISCO



4. R&D Joint Projects

eon  
reality

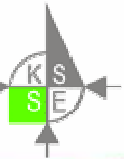
Lenze

FLUOR

- **EU 7th Framework Program**, Coal & Steel Program
- other frameworks

Techno-park, Biofarma, R&D Centers,  
Science & Education Center of Innovation  
Technology

SHAREHOLDERS



1. Biotechnology



2. Biomedical Engineering



3. Mechatronics



4. Civil Aviation



5. Defence Technology



R&D  
Centers

Students' Incubator of Entrepreneurship



Innovation & Technology Transfer Center



# BIOFARMA

## Center of Biotechnology & Biomedical Engineering

CONSORTIUM founded in 2007 by:



1. SUT, 2. Oncology Center in Gliwice,



3. University of Silesia, 4. Medical University of Silesia



to consolidate R&D  
in Biotechnology  
&  
Biomedical Engineering  
in Silesia

Basic science

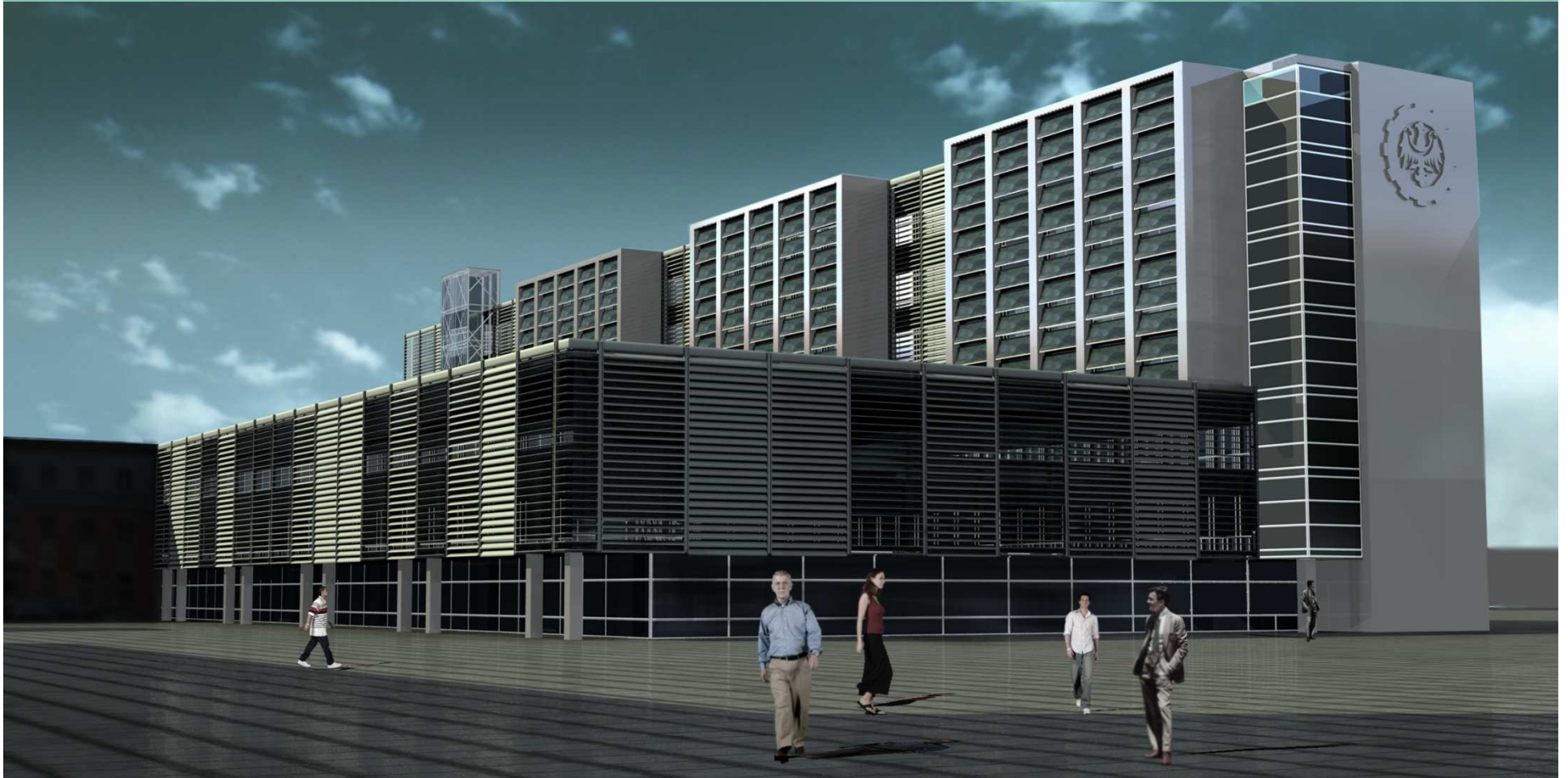
Core facilities

Engineering

Implementation

Marketing

# SUT Science & Education Center of New Technologies (2012)



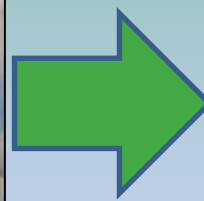
# R&D, Innovation Technology in Silesia

## Foresight 2008 – 2020 Scenario

Old, Airpolluting



Innovation, Clean Technology



1. ICT

2. Energy & Environment

3. Nanotechnology,  
Nanomaterials

4. Biotechnology

5. Biomedical Engineering

6. Mechatronics





# 1. ICT in Silesia



**COMARCH**  
SYSTEMY INFORMATYCZNE

**AITECH**  
Artificial Intelligence Laboratory

**ASSECO**  
SYSTEMS

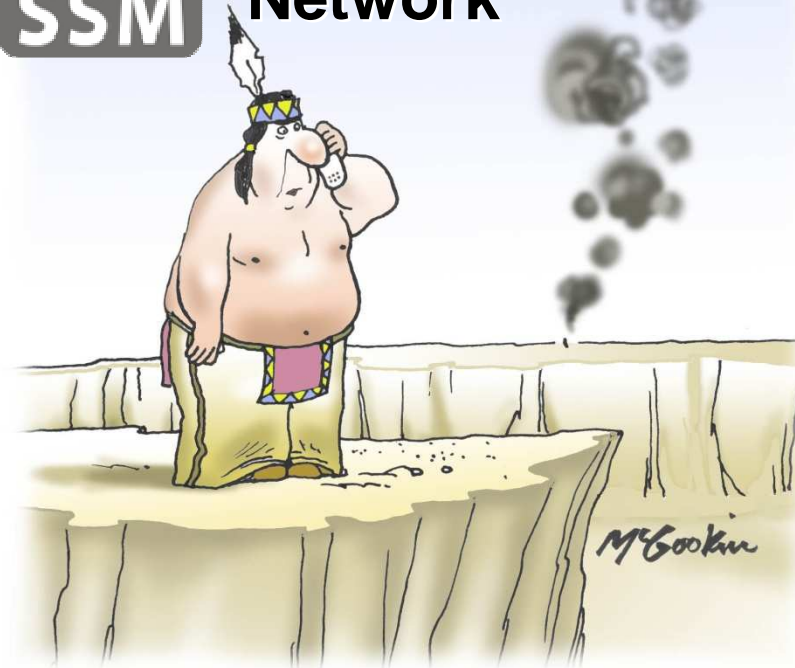
**WASKO**®

**Future Processing**

**IITiS**  
Instytut Informatyki Teoretycznej  
i Stosowanej  
Polskiej Akademii Nauk



**Silesian  
Metropolitan  
Network**



*Oh bugger tradition - next time text me.*

**DisplayLink**

**Mentor  
Graphics**

**CISCO**

**eon  
reality**

**DELPHI**

# Dynamic Development of ICT

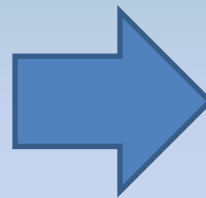
## 2. Energy & Environment in Sil



Traditional Technology



New, Clean



CCS

Carbon Capture & Storage

**„New Face” of coal based technology in Silesia**

**Thank you for your  
attention**



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