How can institutes of technology participate in the problem solution process of societal challenges?

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Profile

The Technische Universität Berlin regards itself as an international well reputated university placed at the German capital in the center of Europe:

- Third largest Institute of Technology in Germany
- Research and Education conducted in combination of natural sciences, engineering and humanities
- Fundamental and applied research:
  - Fundamental research in its classical meaning
  - applied research centred on problems relevant to society today and in the future
- Regional, national and international networking

Zahlen und Daten

Students	29.510
female (ca. 34%)	*9.729*
foreign students (ca. 20%)	*5.988*
Professors	320
Guest professors and ext. lecturers	396
Scientific Assistance	2.264
Staff (techn and admin.)	4.402
Drs (2010)	470
Habilitationen (2010)	17
Budget:	
State funding (2010)	264,81 Mio. €
Third party research funding (2010)	146,5 Mio. €

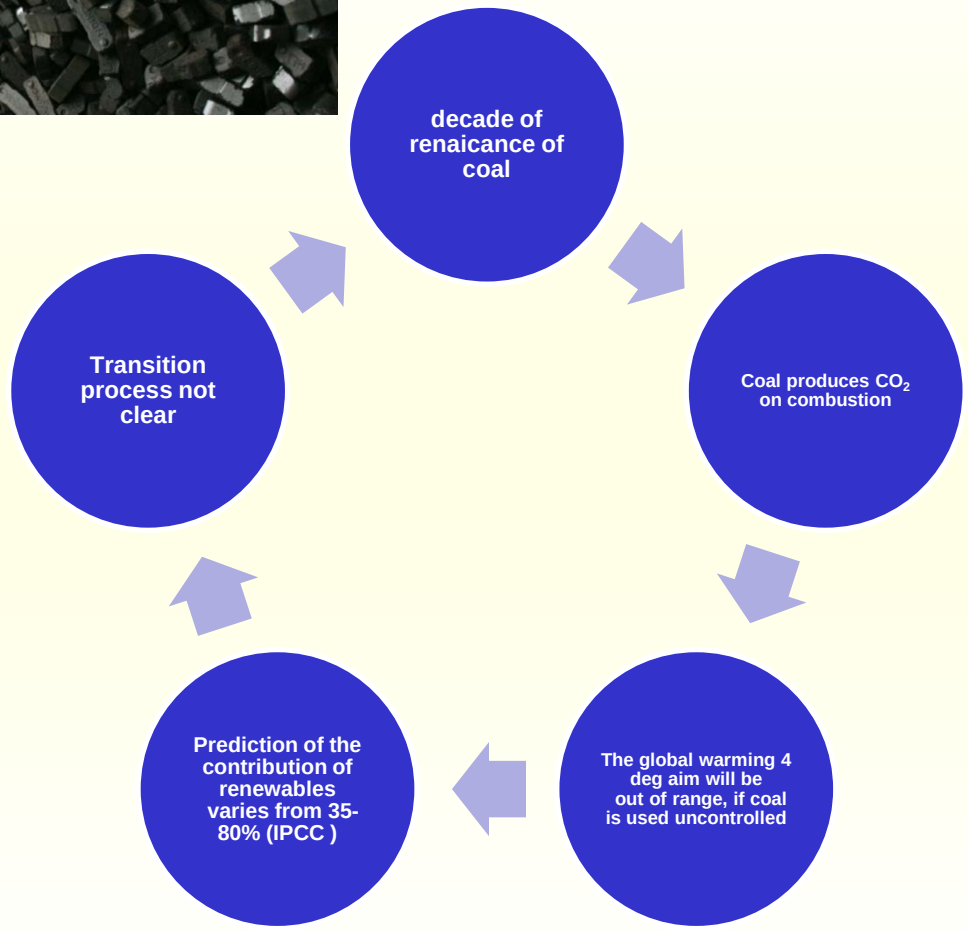
Challenges

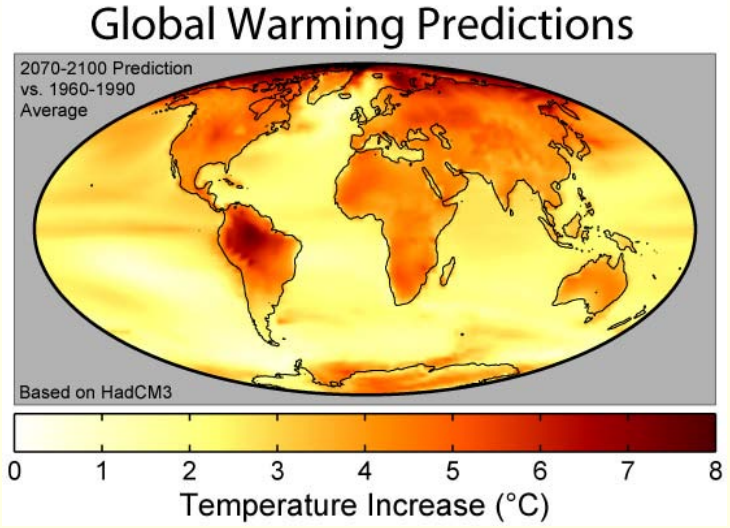
A positive perspective for our future can only be anticipated if the following challenges are met successfully:

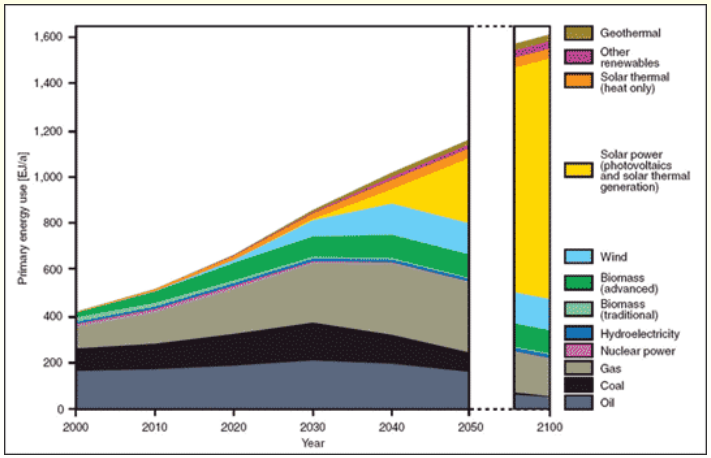
- climate change
- urbanisation
- infrastructure
- resource management, intelligent handling of
  - water, the gold of the future
  - energy (efficiency)
  - food
  - health in an aging society

These fields not only require inventions and innovations but also sufficient finances

Challenges

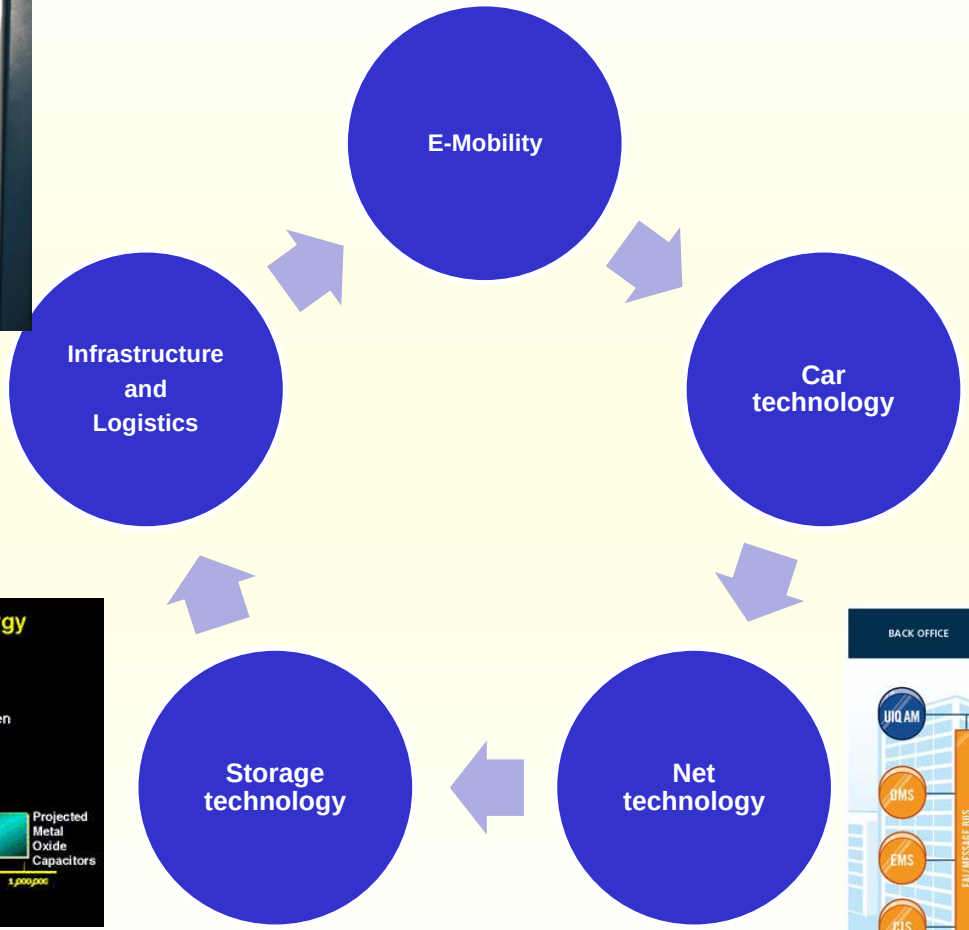

decade of renaicance of coal
Coal produces CO_2 on combustion
The global warming 4 deg aim will be out of range, if coal is used uncontrolled
Prediction of the contribution of renewables varies from 35-80% (IPCC)
Transition process not clear

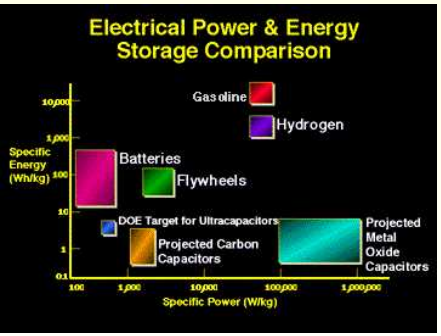

Global Warming Predictions
2070-2100 Prediction
vs. 1960-1990
Average
Based on HadCM3
0
1
2
3
4
5
6
7
8
Temperature Increase (°C)

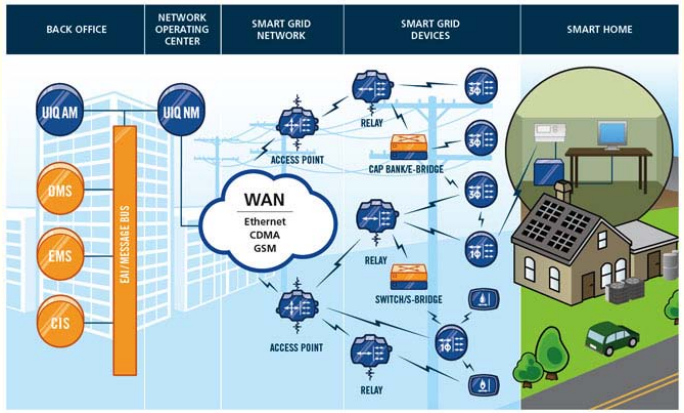

Primary energy use [EJ/a]
1,600
1,400
1,200
1,000
800
600
400
200
0
2000
2010
2020
2030
2040
2050
2100
Year
Geothermal
Other renewables
Solar thermal (heat only)
Solar power (photovoltaics and solar thermal generation)
Wind
Biomass (advanced)
Biomass (traditional)
Hydroelectricity
Nuclear power
Gas
Coal
Oil

Challenges

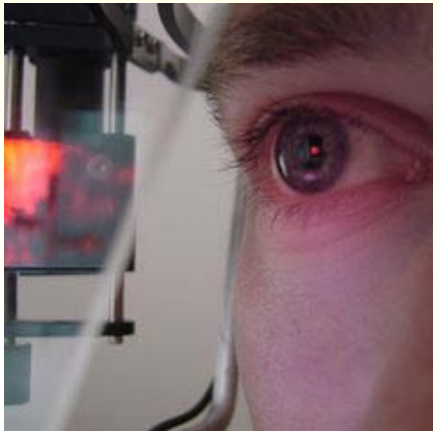

CHARGING STATION
ELECTRIC
PARKING ONLY
WHILE CHARGING
SPONSORED BY:


E-Mobility
Car technology
Net technology
Storage technology
Infrastructure and Logistics


Electrical Power & Energy Storage Comparison
Gasoline
Hydrogen
Batteries
Flywheels
DOE Target for Ultracapacitors
Projected Carbon Capacitors
Projected Metal Oxide Capacitors
Specific Energy (Wh/kg)
Specific Power (W/kg)

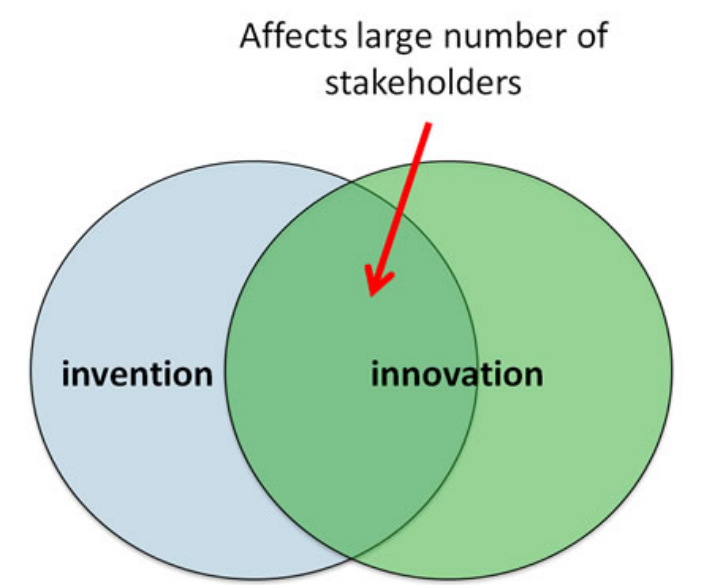

BACK OFFICE
NETWORK OPERATING CENTER
SMART GRID NETWORK
SMART GRID DEVICES
SMART HOME
UIQ AM
UIQ NM
DMS
EMS
CIS
EAI / MESSAGE BUS
WAN
Ethernet
CDMA
GSM
ACCESS POINT
RELAY
CAP BANK/E-BRIDGE
SWITCH/S-BRIDGE

Innovation

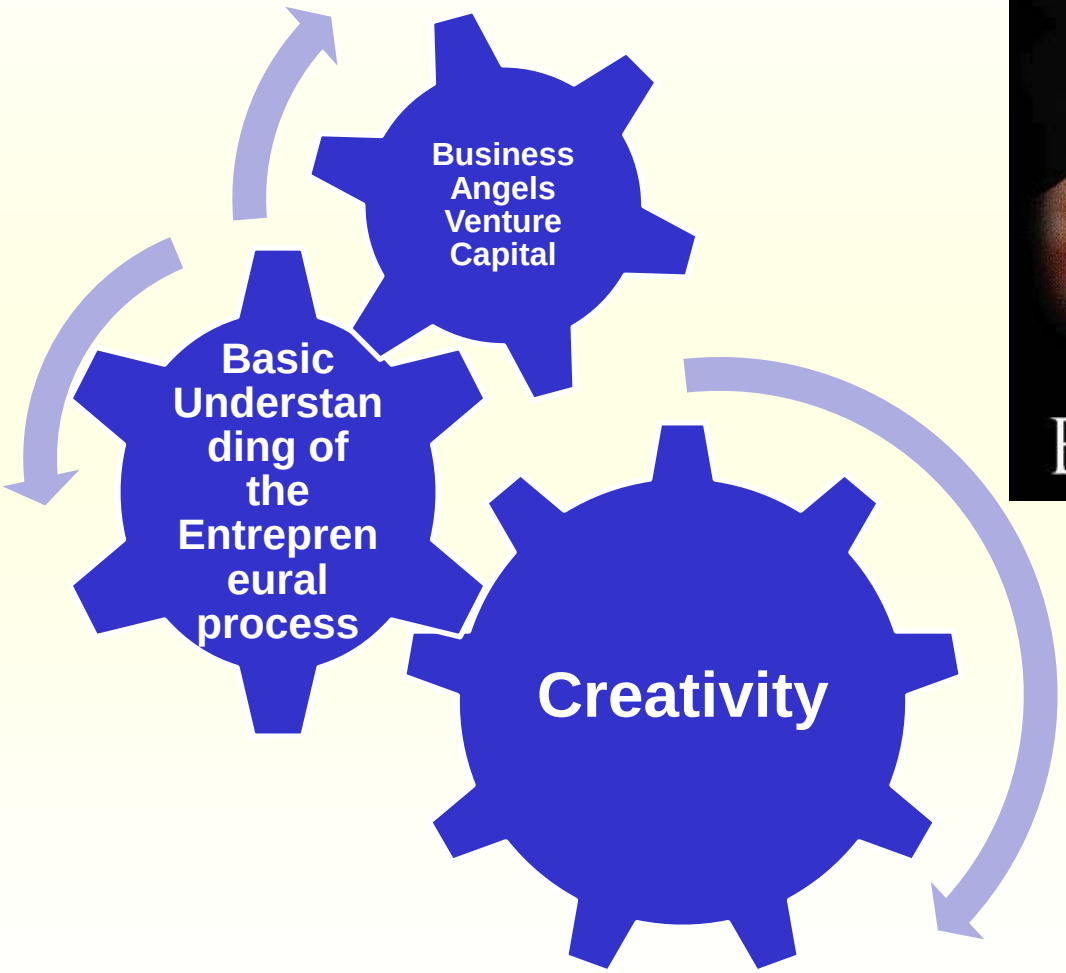


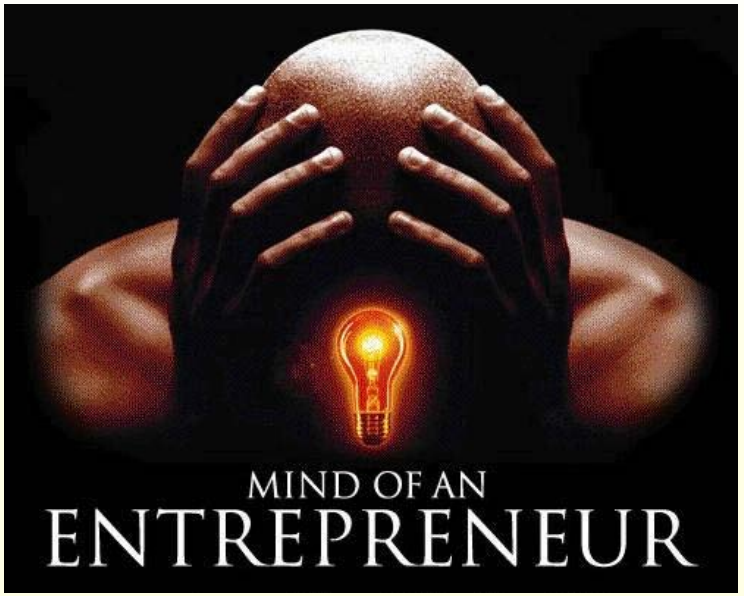
From invention to innovation:

- inventions require the spending of money
- innovations produce profit
- how to bring these cultures together?

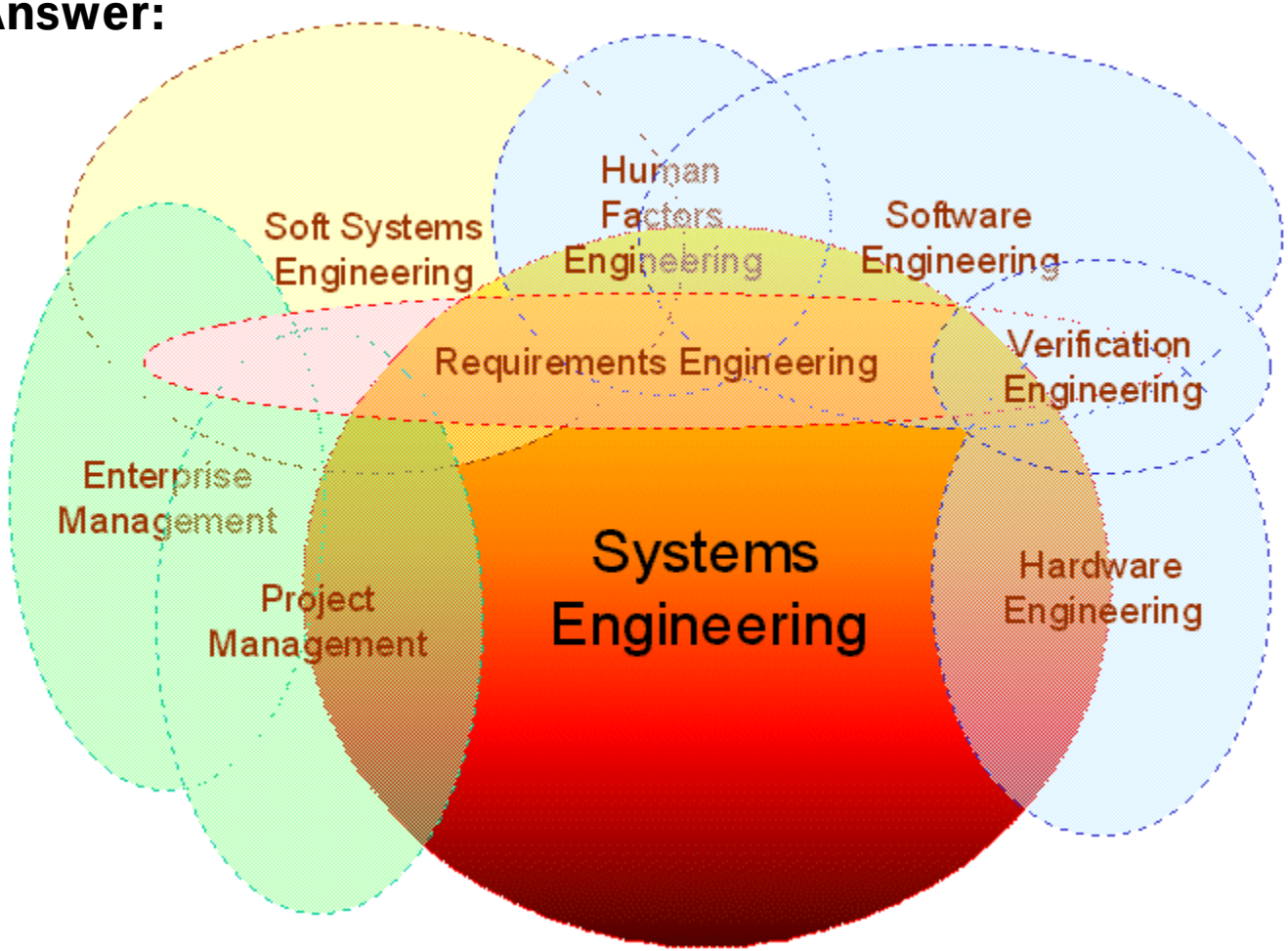


Innovation


Business Angels Venture Capital
Basic Understanding of the Entrepreneural process
Creativity

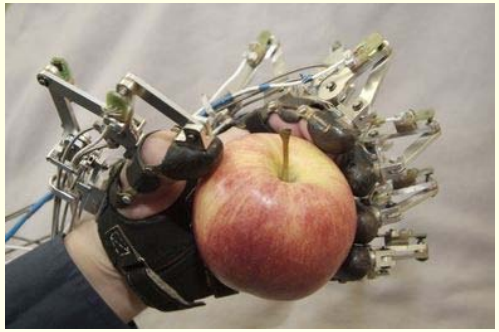

MIND OF AN
ENTREPRENEUR

The Answer:



http://easyweb.easynet.co.uk/~iany/consultancy/systems_engineering/systems_engineering.htm

Deficits in our current organisations to face the challenges



Research

- **Introduce „problem based research based on a system engineering approach on European / International scale“**

  Faculties and schools are not adequate structures for future research. Research today is done in interdisciplinary teams sometimes forming even new transdisciplinary sciences.

  Combine researchers project wise from all relevant faculties and different institutions and provide them with their own budget

- Cultivate **„risky research“**

  15% of the budget of a university should not be subject to financial efficiency assessment.

Formation of thematic research networks based on strategic partnerships to conduct system engineering research

How to prepare for the future

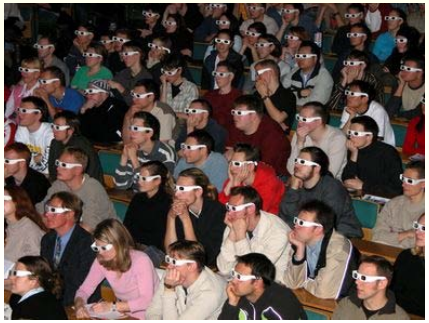
Setup organisation of universities

- Make the university structure more flexible and support young scientists at the same time:

- 50% of chairs are defined monodisciplinary to cultivate the mono-disciplines on the Bachelor level

- 20% of chairs are defined interdisciplinary and **5% as „seed chairs“**

- **25% of all chairs are time limited assignments** for young scientists to respond to structural project needs



How to prepare for the future

Education

- Place „methodolical skills“ based on a sound basis of fundamentals in to the centre of Bachelor curriculum development
- Include entrepreneural aspects in the curricula
- Place Master curricula preferable on the interface of two disciplines , but keep them broad and away from hype-topic
- Try to focus on system´s approach in order to balance specialisation for a following doctorate and generalisation enough to keep the graduates placable in different disciplines