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(3) conclusions



## Research at German universities has expanded since more than 200 years

## • 1803

expansion: Humboldt's Berlin University as model for the union of research and teaching

#### • 1933-45

setback: Germany wages war and takes life of citizens and scientists

#### • after 1945

rebound: Institutes for Technology of Aachen, Darmstadt, Stuttgart become Universities

#### • since 1989

globalization: increase of science budgets and knowledge transfer

## today

digitalization: universities and industry seek to join forces for faster R&D and innovation

## The mid-term goals of the EU assign more tasks to universities in Europe





Source: European Institute of Technology and Innovation

## Public research in Germany is conducted in several institutional branches

#### universities

- 10.000 to 50.000 students
- mission: research, teaching, transfer
- sole institutions to award PhDs and degrees of law, medicine, education
- funding: institutional from Federal states, research projects from German Science Foundation, Federal government, European Union, and industry + others
- top technical universities in alliance of top nine technical universities (TU9)

#### non-university branches

- Max Planck Society, Helmholtz Association, Fraunhofer Society, Leibniz Association
- mission: research (fundamental or applied)
- all fields, strengths in life sciences, physics, technology
- funding from Federal government, Federal States and industry + others





(2) University of Stuttgart and innovation

(3) Conclusions

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## University of Stuttgart is an international research university Germany

- Our vision is to understand and develop Intelligent systems for a sustainable society
- 10 faculties (engineering, mathematics, natural sciences, social sciences+humanities)
- 290 professors, 28.000 students
- budget of 557 mio. € (208 mio. € acquired from public and private funders)

- competitive research in simulation science, manufacturing, digital humanities, quantum physics, architecture and construction of adaptive buildings, energy
- "Stuttgart way" of linking disciplines
  - intelligent materials and sensors
  - intelligent machines and buildings
  - intelligent ways of communication
  - reflection and assessment of technologies
  - transfer of knowledge

#### 4 examples for partnerships for research and innovation in Stuttgart

• <u>#1: ARENA2036</u> – Cooperative Research Campus – Industry on Campus

Public-private partnership between university, non-university research institutes, multinational and medium enterprises Topic: Advanced future manufacturing + functional materials + digitalization (= industry 4.0)

 <u>#2: Cyber Valley</u> - Joint use of big data - Publicprivate partnership between universities, Max Planck society, multinational corporations and Federal State.

Topic: Artificial Intelligence (AI)

 <u>#3: Reallabor</u> - Citizen Lab -Participation between science and society
 Topic: urban planning

 <u>#4: IBA 2017</u> – Metropolitan
 Association - for developing new urban quarters and urban designing transportation 2017-2027
 Topic: Archineering and social sciences

#### **Example #1** ARENA2036 Cooperative Research Campus - Partnership for Innovation

- First Federal "Cooperative Research Campus" funding
- Partners: universitiy and industry
- Scope: multi- and interdisciplinary and long-term (> 15 years)
- Goal: combination of basic and applied research and fast transfer to innovation
- funding: Federal grant 30 Mio. €

   (15 yrs. x 2 Mio. €/ yr.) and matching
   30 Mio. € by industry
   overall goal: > 20 Mio € funding / yr.
- contracts specify general and project-driven protection of intellectual property



#### **ARENA2036: Cooperative Research Campus of the University of Stuttgart**



currently: automated assembly of identical frames (example: Mercedes in Finland) future: research towards modular, cyber-physical manufacturing units



## **ARENA2036** offers a research factory for co-working of diverse partners



on campus

#### **Concept for collaboration**

 joint development of production and manufacturing

- flexible setting for knowledge work based on hardware
- short distances and fast decisions for agile developing
- multidisciplinary transfer for future employees
- partner mix: university, research institutes, industry (industry partners with large own R&D)

## **ARENA2036 took 5 years to start major research partnerships**

- increase of research institutions from 4 to 6
- increase of industry partners from 3 to 25 partners
- new collaborations between industry partners
- environment for start-up businesses with incubator/accelator
   PLUGANDPLAY
- PhD and MSc students



#### **Federal** Excellence internatioprogram nalisation interentrepre-Cyber **ARENA**2036 disciplinarity agility neurship Valley "Stuttgart way" Institute for **Artificial** training Intelligence diversity recruitment

#### **ARENA2036** is a central component of the strategy of the university

## **Example #2: Cyber Valley - Public-private R&D in artificial intelligence**







Sources: Bosch, Technol Rev, MPS

## **Cyber Valley**

Will boost Artificial Intelligence research and development

- Brings together international key players from science and industry to concentrate their research activities in the field of Artificial Intelligence
- Cyber Valley partners will establish new research groups and professorships in the fields of machine learning, robotics, and computer vision in a new research center in the Stuttgart-Tübingen area in Germany
- Key element: training of up to 100 doctoral students



# Cyber Valley partners use diverse big data for R&D in artificial intelligence

#### Structure



Source: Bosch, MPI Stuttgart

- Concept: research in machine-learning needs insight into corporate, real-life big data
- Measures: public and industry-endowed professorships, junior groups
- Budget: for companies 1.2 Mio. € per year to join and additional endowment of chairs
- Research goals: Al and machine learning (e.g. for cars and human computer interaction)
- New element for public-private campus: attract start-ups

## Cyber Valley partners push for collaborative R&D

- University of Stuttgart and University of Tübingen, distance 40 km
- Max Planck Institute for Intelligent Systems (branches in Stuttgart and Tübingen)
- German and US corporations
- Federal State of Baden-Württemberg





## Cyber Valley grows as artificial intelligence hub for academia and industry

- Two more large industry partners from the US have joined (amazon, facebook)
   → Cyber Valley goes global
- Recruitment of junior group leaders
   → Cyber Valley attracts talent
- On-going negotiations on IP distribution
   → Cyber Valley partners are subject of
   different jurisdictions and need different
   kinds of agreements



## **Example #3: Reallabor as Citizen Lab**

 Real Labor ran for three years and brought citizens and grassroot initiatives into research projects exploring new ways of planning for urban mobility



Source: Reallabor

## Example #4: Metropolitan Association IBA 2017-2027

The IBA International Architecture Exhibition runs in the Stuttgart region from 2017 to 2027 and will hatch mobility and measures as well as new residential quarters. It will test solutions for regional cooperation. The university is one of five partners.



Source: https://iba2027.de/





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## **Conclusions Partnerships for innovation of the University of Stuttgart**

- We use Federal programs to start new research environments with local universities, research institutes and local and global companies
- We aim to take a holistic perspective towards technological innovations. The university conceives and implements projects involving multiple disciplines and players
- We set up long-term research projects with local non-university research institutes and industry that aim for **transfer of knowledge**
- We are adding education and research on building start-up businesses to our portfolio



Source: www.expat-news.com

## **Conclusions Partnerships for innovation of universities in Germany**

- Germany shifts toward public-private partnerships for innovation
- Public and private budgets for research and R&D go into measures that seek to incubate technology for innovations
- Germany's universities push and are pushed to hatch ideas for growing sectors of the economy such as IT, start of new businesses and "industry 4.0"



Source: https://digitales-wirtschaftswunder.de



## Thank you!



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