Innovation in Science, Engineering and Technology

Karen Maex
Vice-rector K.U.Leuven

KATHOLIEKE UNIVERSITEIT LEUVEN

SET research and education

- Research based education
- Value chain thinking

SET and societal challenges

Innovation in education

Research based education

Education

- Transfer of information
- Generic knowledge
- Probing theories and models
- Synthesis and conceptual thinking
- Skills and competences
- Academic education ➔ based on research
- Process of knowledge creation and acquisition
- Lifelong learning

Academic research ➔ Strengthened by teaching

Research

Leadership

How to deal with uncertainties and complexity
Role of context and interpretation
How to convince
Imagination
Creativity

Tech transfer:
From research to proof of concept & IP
Developing a business plan
Finding team and investors
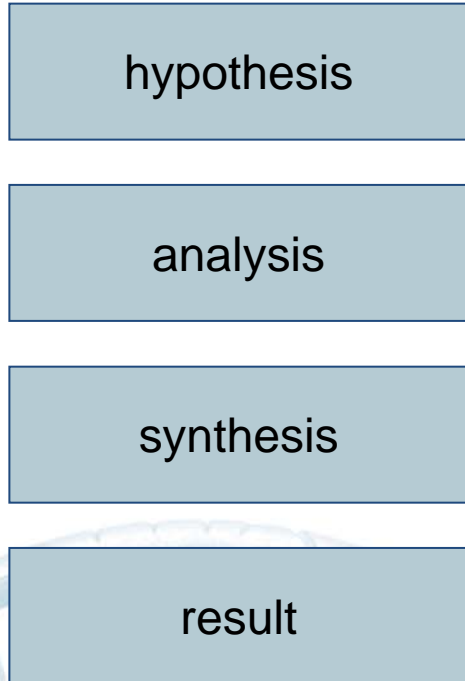Valuation and deal structuring

Entrepreneurship

Societal actors
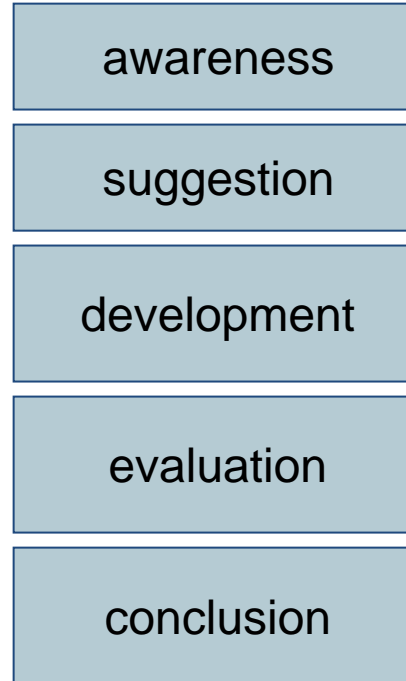Organisations
Industry
Spin-offs
…

Value chain thinking

Natural science paradigm

hypothesis

analysis

synthesis

result

reduce to essence
comprehend

Paradigm research by design

awareness

suggestion

development

evaluation

conclusion

= | tentative design |

complexity
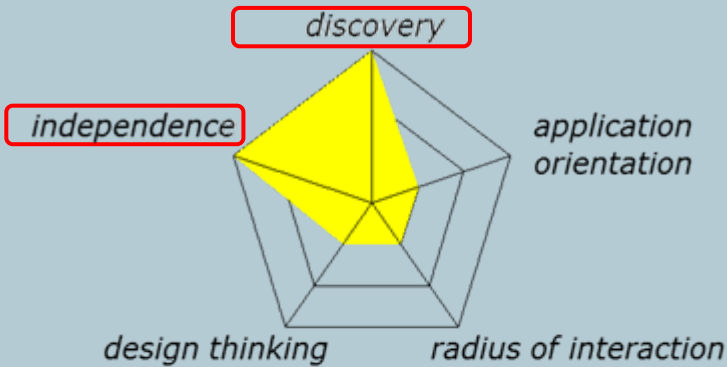create

Research by design leads to new scientific contexts
→ New conceptual basic questions
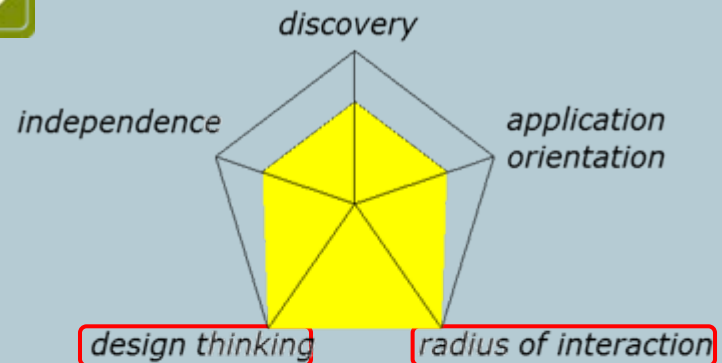→ New curiosity driven research

Research profiles

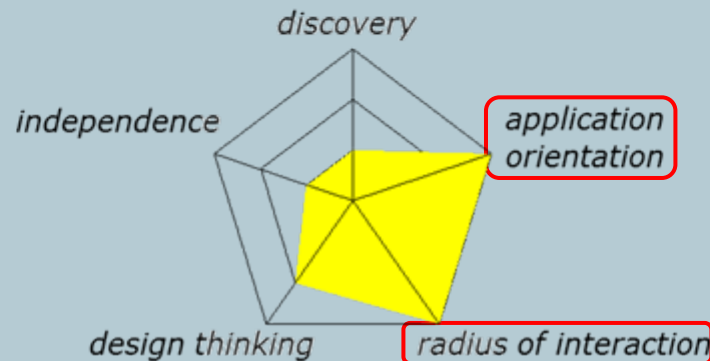

science
The "researcher-knowledge creator"

discovery
independence
application orientation
design thinking
radius of interaction

(bio) engineering science
The "researcher-problem solver"

discovery
independence
application orientation
design thinking
radius of interaction

engineering technology
The "researcher-developer"

discovery
independence
application orientation
design thinking
radius of interaction

The need for translational research

Academic research
To push boundaries
Interrelated with education

Vocational educational activities

Fundamental - Applied

Science

(Bio) Engineering Science

Engineering Technology

knowledge translation

Tied together with the field of employment

synergy
cross-fertilisation

cross-over

discovery
creativity
basic research

discovery
application
creativity

creativity
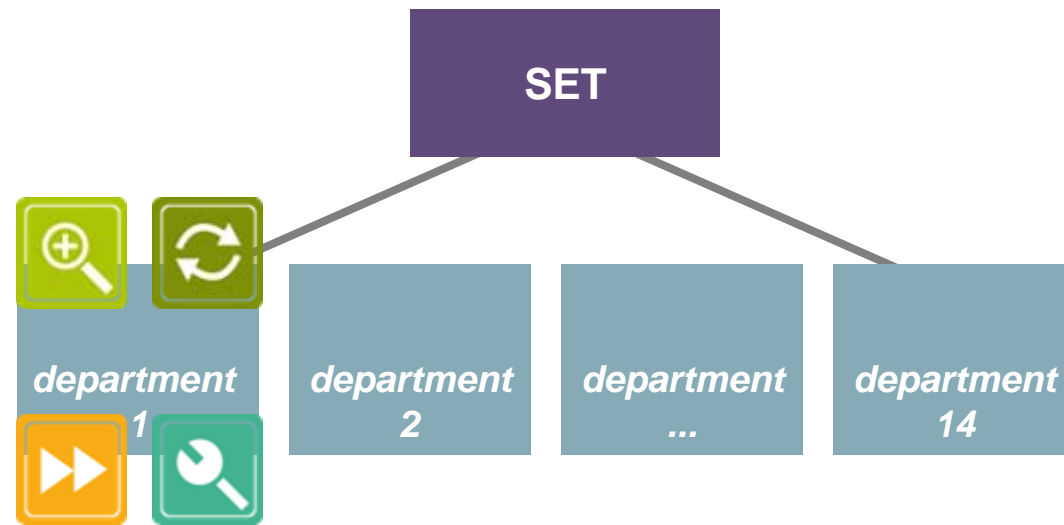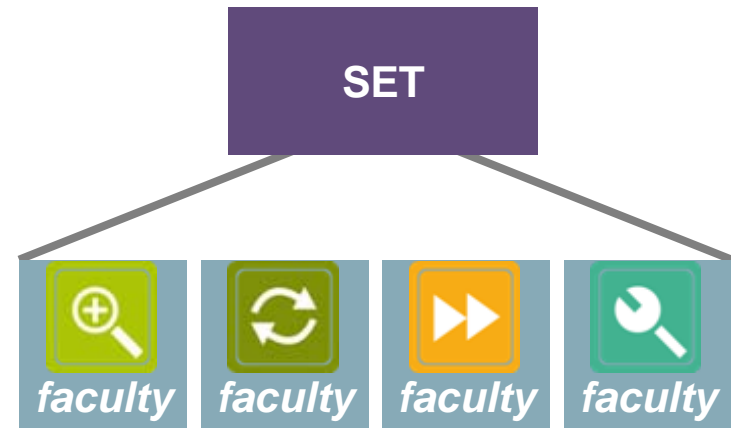innovation

time

Combining different forms of research and gearing them to one another is an opportunity for innovation

Value chain and profiles

- Value chain thinking
  - four profiles for education
  - one research area

  - reflected in structure of the university

- Need for different **profiles in education**
  - ⇒ anchored in different faculties
  - ⇒ students, personnel, PhD, graduates

- **Single research area** aiming at complete value chain
  - ⇒ department structure

Innovation and Societal impact

Innovation process

- Based on knowledge, not exclusively from research

- Requires entrepreneurial action

- Power to imagine, creativity

Societal impact

- Incentives, i.e. intellectual property rights

- Information, i.e. business models, market price mechanisms

- Imagination: needs of society, alternative logics, other rationalities for doing business

Why imagination has become more important:
- globalisation
- speed of communication
- interactivity

SET in society: societal challenges

Science Engineering and Technology

Specialists
Entrepreneurship
Creativity
Leadership

Science, Engineering and Technology

Future Decision Makers

Social Science Humanities

Specialists
Elective courses SET?

Science Engineering &Technology

Future Decision makers

- State of the art technology
- Economic and societal ecosystems

- System thinking
- Decision making processes
- Strategy and policy

- Scenario building

- Novel education methods with a focus on interactivity and lifelong learning
- Driven by societal challenges
- Global
- In close collaboration with private and public enterprises

Innovation in education

- Gap between profiles of graduates and needs

- University collaboration with public and private enterprises
  - at level of faculty and education programs
  - by TTO for research
  - at the level of the university: to match future needs for society

  Test cases with new master concepts in a second master education

  Ba- ma is very rigid for major innovations

  both for content and approach