Innovation ecosystems

It is a well-known fact that most breakthrough innovations and new businesses are not created in isolation but through collaborative arrangements that enable organizations to combine their individual offerings into coherent solutions

Innovation ecosystem

‘Network of interconnected organizations, **connected to a focal firm or a platform**, that incorporates both production and use side participants and created as appropriates new value through innovation.’

(Autio & Thomas 2014)

Innovation ecosystem

- Emphasizes more market mechanisms than institutionally oriented innovation system literature
- Embedded in business studies (but also regional and innovation studies)
  - Earlier almost explicitly in economics, regional studies, and economic geography
- Organic metaphors replace mechanical ones
- **Leading actor** enables ecosystem members to invest in a shared future and common goals
- Loose network relationships
- Ecosystem members share the fate of the entire system (Moore, 1993)
- Access to global innovation ecosystems highlighted

Photos: Pixabay

Rinkinen (2016): “**ecosystems are first and foremost global**. The role of a region is not visible in the literature concerning ecosystems. The national level perspective is the main way in which ecosystem discussion is connected to the geographical context. It is generally difficult to define the ecosystem boundaries, whether they are geographical or not.”

But… local and regional development scholars and policy makers have woken up

Photo by Pascal Debrunner on Unsplash

Platform policy approach

(Asheim, Boschma & Cooke, 2011; Ailisto et al 2016)

- Focuses on making connections between different but related activities
- Represents a strategy based on related variety for diversification
  - Related variety is defined on the basis of shared and complementary knowledge bases and competences

- Meeting points for different needs
- Network effects
- Multi-way interaction

Ecosystems bringing talent together

The ecosystems unite experts from multiple fields, facilitate making use of opportunities and help with innovation.

The ecosystems already in place:

- Camera technology – Tampere Imaging Ecosystem
- Artificial intelligence – Tampere AI ecosystem
- Mobility – ITS Factory
- Startup Tampere
- The Tampere Automotive Cluster
- Tampere Region Safety and Security Ecosystem
- Connectivity ecosystem
- Tampere Region Circular Economy Ecosystem
- Film Tampere
- Education and learning
- Intelligent Machines and Automation
- Health technology and life science

12
ecosystems - for open and smart collaboration.

Image: Visit Tampere / Mirella Mellonmaa 2023

Bioeconomy in Central Finland

"An economy that relies on renewable natural resources to produce food, energy, products and services … new economic growth and jobs in line with the principles of sustainable development … bioeconomy output up to EUR 100 billion by 2025 and to create 100,000 new jobs

(Suomen biotalousstrategia, 2014)

Metsä Group Website

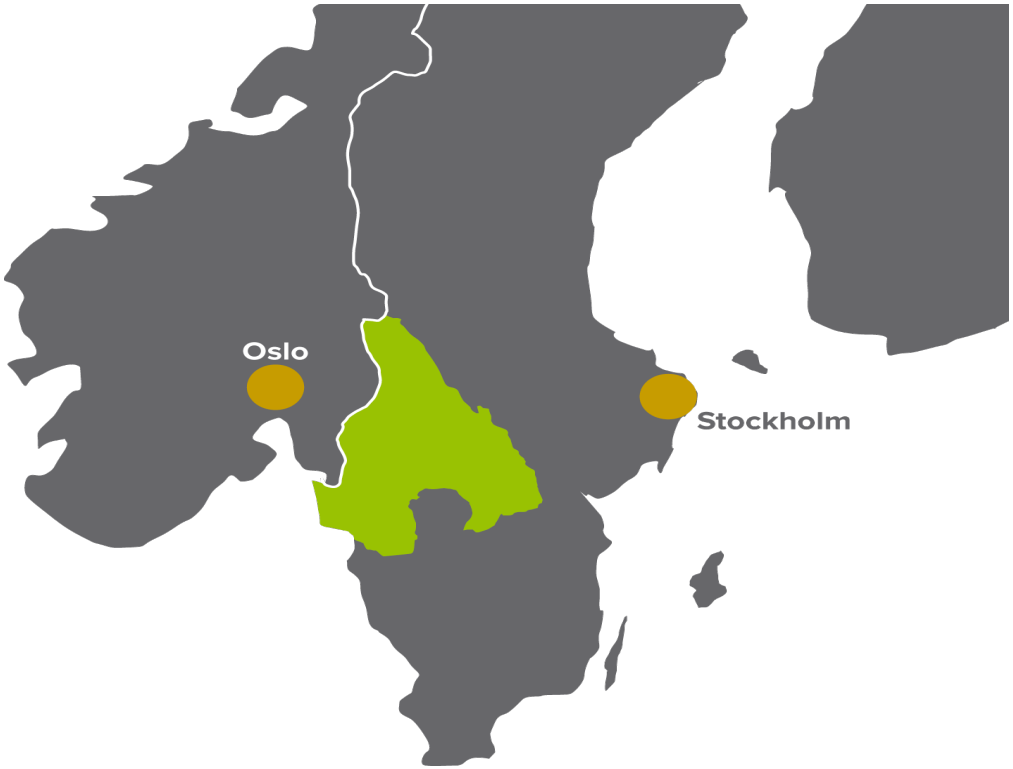
News 21.4.2015 15:45 | updated 21.4.2015 15:45

Metsä Group to build next-gen bioproduct mill – to make pulp, products, power

Metsä Group has announced it will build a next-generation bioproduct mill in Äänekoski. Building the new bio-friendly mill, which will produce pulp – and twice the energy it requires – will cost Metsä about 1.2 billion euros. The investment is said to be the largest-ever by the forest industry in Finland – and the world's largest softwood pulp mill.

How Metsä Fibre pulp mill looks these days, before the planned next-generation mill which is projected to be complete towards the end of 2017. Image: Metsä Group

Paper province,
an example of a cluster policy
Värmland, Sweden



- Packaging materials
- Packaging solutions
- Specialty paper
- Board
- Pulp- and paper machines
- Tissue paper machines
- Components
- Coating machines
- Barriers
- Engineering services
- Bio-energy solutions
- R&D

WE SHALL BE THE
LEADING
COMPETENCE NODE
FOR FOREST BASED
BIOECONOMY

PAPER PROVINCE

- All the main players mobilized
  - PP2.0 is a successful dating agency
- Strong support from the region
- Shared enthusiasm
- Collective self-confidence
- Region branding
  - “Paper province” reflects history and the strong identity of the region but may be misinterpreted by outsiders
- Strong industrial base and impressive set of competences

Examples of innovation policy

Major schemes - highlights

- Regional Centre of Expertise Programme (1994-2013)
- Centres of Science Technology and Innovation (Shok) (2006-2016)
- Growth engines (2018->)

Strategic Centres for Science, Technology and Innovation (2006 - 16)

A cluster-flavored innovation policy programme

- The Forest Sector's Strategic Centre (Forestcluster Ltd)
- Finnish Metal and Engineering Competence Cluster (FIMECC Ltd)
- ICT cluster (Tivit Ltd)

Bottom up clusters

- Cluster for Energy and Environment (CLEEN Ltd)
- Strategic Centre for Health and Wellbeing (SalWe Ltd)
- Built Environment Innovations (RYM Ltd)

Top down clusters

The Finnish Strategic Centres for Science, Technology and Innovation (SHOK) [2006-2016]

- Non-profit limited-companies with research programmes
- Concentrated funding scheme
  - In the Finnish Metals and Engineering Competence Cluster (Fimecc ltd.) the size of research programmes varied between MEUR 20 and MEUR 51
- Dialogue between companies and research institutions
- Established and run by leading firms, universities and other stakeholders

Expectations:

(a) Industry will become more committed into 5-10 year R&D -programs, (b) increased co-operation between major partners, (c) new more efficient way of funding R&D, and (d) renewal of the existing strongholds of the Finnish economy

Criticism

- backward looking, based on the 90's
- VTT and universities dominated
- focus too much on process innovation
- no new and revolutionary changes and
- play a conserving role in the economic structure

Growth engines (2018->)

- The main objective is to generate billion-euro export businesses in Finland
  - Collaboration between companies of different sizes, research organizations and public actors to achieve a common concrete business goal.
  - Launching a new operator, a **platform company** to achieve a business goal
  - The construction of the platform company's business and through it generating extensive networking effects

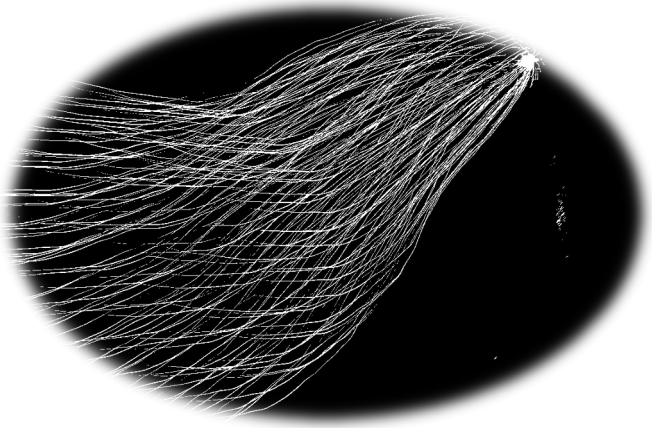
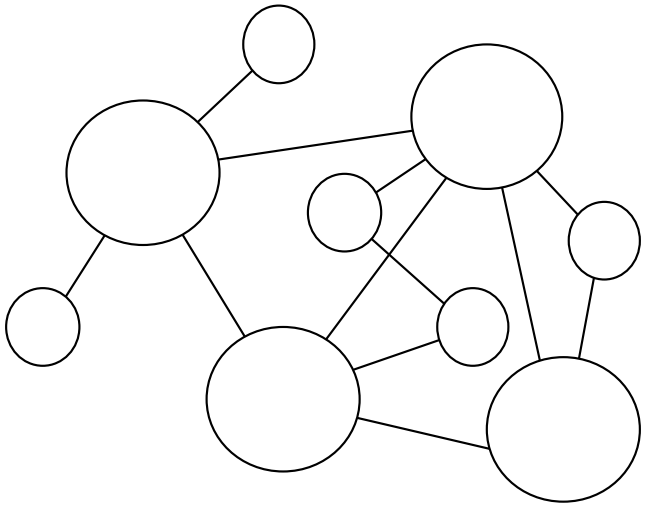
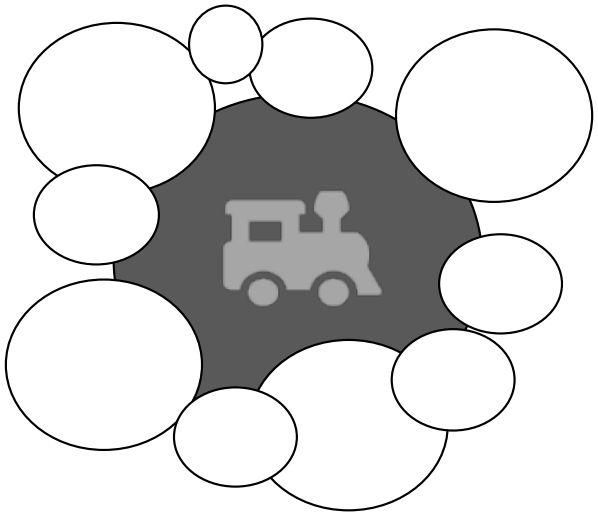


Photo by Hunter Harritt on Unsplash

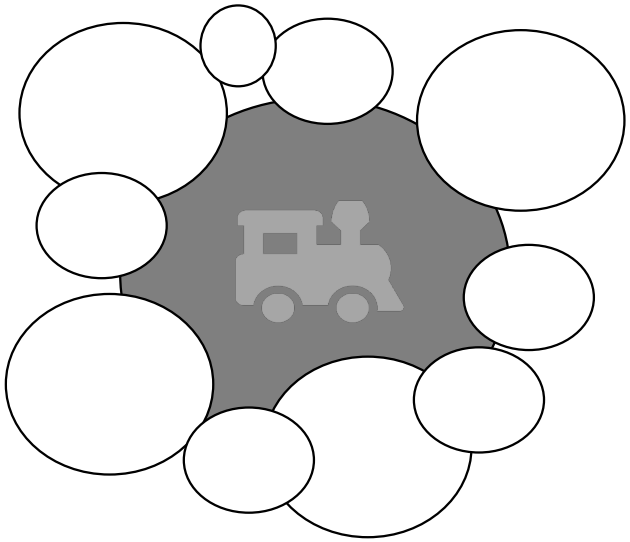


A cluster



An innovation ecosystem with an engine company

The Growth Engine programme



Leading companies

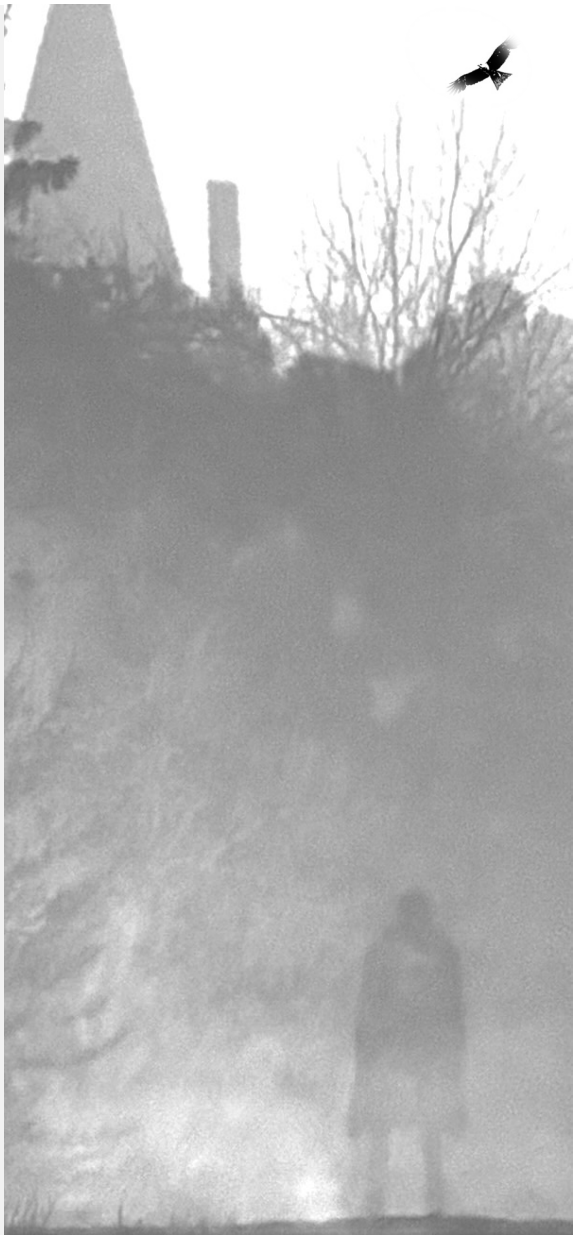
- **NESTE:** Sustainable and globally scalable solutions for the R&D of raw materials that reduce the use of crude oil.
  https://www.businessfinland.fi/4a9cd1/globalassets/finnish-customers/01-funding/06-ecosystems/neste_veturi_tiekartta.pdf
- **ABB:** Platforms for the optimal generation and consumption of electricity in a carbon-neutral society.
  https://www.businessfinland.fi/492bb4/globalassets/finnish-customers/01-funding/06-ecosystems/abb-green-electrification-2035-veturi-roadmap.pdf
- **FORTUM & METSÄ GROUP:** New fibre-based products for consumer markets to reduce the carbon footprint.
  https://www.businessfinland.fi/49a764/globalassets/finnish-customers/01-funding/06-ecosystems/expandfibre_ecosystem-roadmap_may-2023.pdf
- **KONE:** Mobility solutions for urban environments in line with the principles of sustainable development.
  https://www.businessfinland.fi/49073c/globalassets/finnish-customers/01-funding/06-ecosystems/kone-the-flow-of-urban-life-veturi-roadmap.pdf
- **NOKIA 5G:** Making Finland a pioneer in 5G networks and industrial 5G (ended).
  https://www.businessfinland.fi/suomalaisille-asiakkaille/palvelut/rahoitus/veturiyritysten-ja-ekosysteemien-rahoitus
- **SANDVIK:** Globally competitive electric and digital solutions for heavy machinery.
  https://www.businessfinland.fi/492bb4/globalassets/finnish-customers/01-funding/06-ecosystems/sandvik-veturi-roadmap.pdf
- **TIETOEVRY:** Trust-based digital services.
  https://www.businessfinland.fi/494766/globalassets/finnish-customers/01-funding/06-ecosystems/20220221_tietoevry_veturi_public_roadmap.pdf
- **KONECRANES:** Zero4 material flow.
  https://www.businessfinland.fi/499c0b/globalassets/finnish-customers/01-funding/06-ecosystems/konecranes-zero4.pdf

Challenger companies

- **BITTIUM:** Seamless and secure connectivity.
  https://www.businessfinland.fi/4904f7/globalassets/finnish-customers/01-funding/06-ecosystems/bittium_seamless-and-secure-connectivity-2024.pdf
- **PONSSE & EPEC:** Unlocking sustainability in off-road and commercial vehicles.
  https://www.businessfinland.fi/49bbc4/globalassets/finnish-customers/01-funding/06-ecosystems/ponsse_epec_forward27_roadmap.pdf
- **DANFOSS:** Fossil-free future.
  https://www.businessfinland.fi/49c1e1/globalassets/finnish-customers/01-funding/06-ecosystems/danfoss_fossil-free-future_roadmap_2023.pdf
- **MIRKA:** Shaping the green transition.
  https://www.businessfinland.fi/494803/globalassets/finnish-customers/01-funding/06-ecosystems/mirka_shape-02-2024.pdf
- **KEMPOWER:** Heavy electric traffic ecosystem.
  https://kempower.com/news/heavy-electric-traffic-ecosystem-program-boosted-by-10-million-euros/
- **VALIO:** Food 2.0
  https://www.businessfinland.fi/491a86/globalassets/finnish-customers/01-funding/06-ecosystems/food-2.0-roadmap.pdf

Connected to EU RRF

- **BOREALIS POLYMERS:** Sustainable plastic industry.
  https://www.businessfinland.fi/49542b/globalassets/finnish-customers/01-funding/06-ecosystems/borealis-spirit-veturi-roadmap-20220318.pdf
- **MEYER TURKU:** Climate-neutral cruise ship and shipyard.
  https://www.businessfinland.fi/494cb5/globalassets/finnish-customers/01-funding/06-ecosystems/meyer-turku-2022-03-18-necoleap-veturi-roadmap.pdf
- **VALMET:** Circular economy technology.
  https://www.businessfinland.fi/4a5208/globalassets/finnish-customers/01-funding/06-ecosystems/beyond-circularity-roadmap-valmet-september-2023.pdf
- **NOKIA EDGE:** Energy-efficient edge-computing.
  https://www.businessfinland.fi/494a77/globalassets/finnish-customers/01-funding/06-ecosystems/nokia-veturi_competitive-edge_roadmap_2601_2022.pdf
- **WÄRTSILÄ:** Zero-emission marine.
  https://www.businessfinland.fi/494cf9/globalassets/finnish-customers/01-funding/06-ecosystems/wartsila-zem-leading-company-ecosystem-roadmap.pdf



At best innovation policy creates interpretive spaces

- Sheltered spaces for collective search, experimentation and interpretation
  - where fears of the risk of private appropriation of information do not disrupt the open-ended futures-oriented conversations (Lester & Piore 2004)
  - where collective sense-making is possible (learning new vocabulary, thinking, partners, etc.)
  - where one is not only learning to innovate or detecting system failures but is enabled to seek futures with relevant partners (and to find relevant partners)

The Roles of Universities

Many roles

- Universities are different
- Disciplines are different
- Regions and cities are different
- Countries are different
  - → **No one size fit all model**

- Academic science and universities have become increasingly entrepreneurial
- It is an imperative to raise funds for a research group – internal pressure to engage – tensions between academic excellence and societal relevance

Models

- Entrepreneurial University
- Triple helix
- Civic university
- Engaged university - scholarship of engagement, stewardship of place
- Regional Innovation Systems
- New Production of Knowledge (Mode 2 knowledge)

The concept of knowledge-based regional economic development is derived from activities of the New England Council, representing academic, business and political leaders. Based on the formation of firms from research at MIT in the 1920s, MIT President Karl Compton proposed to utilize the region's comparative advantage, its extensive academic base, systematically to create new firms from scientific research. In the 1930s, New England business and political leaders were open to new ideas, given the failure of traditional business models of regional development.

(Jacob & Helsström 2000)

The Triple Helix Model

(Etzkowitz & Leydesdorff 1997; Etzkowitz 2008)

A popular approach for understanding how the dynamic interaction between 'the three institutional spheres' (universities, industries and government) fosters entrepreneurship, innovation and economic growth

Key assumptions

- Universities are playing a central role in innovation side by side with industries and governments
- While earlier innovation policy was to a large extent designed and implemented by governments, today it is an outcome of complex interplay between governments, industries and universities
- **In addition to taking care of their traditional functions the three institutional spheres also adopt new roles and also perform the roles of the other spheres**
  - Not much empirical evidence!

Entrepreneurial University

- Entrepreneurship as additional role alongside teaching and research
- Focus on commercialisation of technology through licences and spin offs
- Partnership focused on commercialisation and external funding of research
- Focus on science and technology

Three steps towards an entrepreneurial university

1. The ability to set a strategic direction
2. A commitment to seeing that the knowledge developed within the university is put to use, especially in its region.
3. Reverse dynamic moving from problems in industry and society, seeking solutions in academia

Entrepreneurial university

Interaction

- The entrepreneurial university interacts closely with the industry and government; it is not an ivory tower university isolated from society.

Independence

- The entrepreneurial university is a relatively independent institution; it is not a dependent creature of another institutional sphere.

Hybridization

- The resolution of the tensions between the principles of interaction and independence are an impetus to the creation of hybrid organizational formats to realize both objectives simultaneously.

Reciprocality

- There is a continuing renovation of the internal structure of the university as its relation to industry and government changes and of industry and government as their relationship to the university is revised.

- As of 2014, MIT alumni have launched 30,200 active companies, employing roughly 4.6 million people, and generating roughly $1.9 trillion in annual revenues.
  1 900 000 000 000 000 000 dollars
- 31% have filed patents and 34% consider themselves inventors
- 12% established a company
- 38% worked in early staged ventures

- In the 2000s, alumni launched around 12,000 new companies
- > 30 percent of all the surveyed companies are located in Massachusetts, 8 % in Cambridge; 20 % in California and 23 % in other countries

In 60 years

Roberts et al: Entrepreneurship and Innovation at MIT

Why Boston Area and SV: Six elements

- Pillar companies
  - For example, Apple, Google, Facebook and Oracle
  - For example, General Electric and iRobot
- Universities
  - Universities are among the world's best sources of intellectual property and talent.
- Human capital
  - From pillar companies, universities, and talent from around the world. These places have an ample, if expensive, pool of talent
- Investment capital
  - Start-ups need different kinds of capital at different stages
- Mentoring
  - Experienced investors and executives mentor companies and talented professionals
- Values
  - Silicon Valley and Boston area have a unique set of values that guide the way people behave.

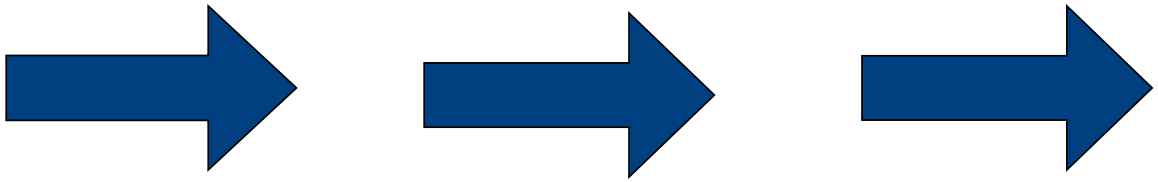
Table 1
Contrast between Ivory Tower and entrepreneurial university.

No.	Ivory Tower University	Entrepreneurial university
1	Isolated from the society	Open and serve to the external society
2	Teaching on campus	Teaching on/off campus
3	Knowledge production for own sake	Polyvalent knowledge produced
4	Meandering stream of basic research	Multiple sources of input into research direction
5	Useful knowledge as accident	Useful knowledge sought
6	No organizational technology transfer capability and no firm formation	TTO, Incubator integrated into innovation strategy to foster start-ups
7	Discipline-based departments as primary units →	Departments and inter-disciplinary centers have equal status
8	Single internal stakeholder	Multiple stakeholders –internal and external
9	University administration only from academia →	University administration from multiple sources, including industry and government
10	Funding as matter of right →	Funding as matter of exchange, something to be earned
11	Operation for self sustainability	Make significant contribution to regional development as well
12	Only academic mind-set	With entrepreneurial ethos

Mode I - as traditional disciplinary research

Mode II - as new form of knowledge production in the context of application

Traditional (linear) view of R&D and innovation is flawed

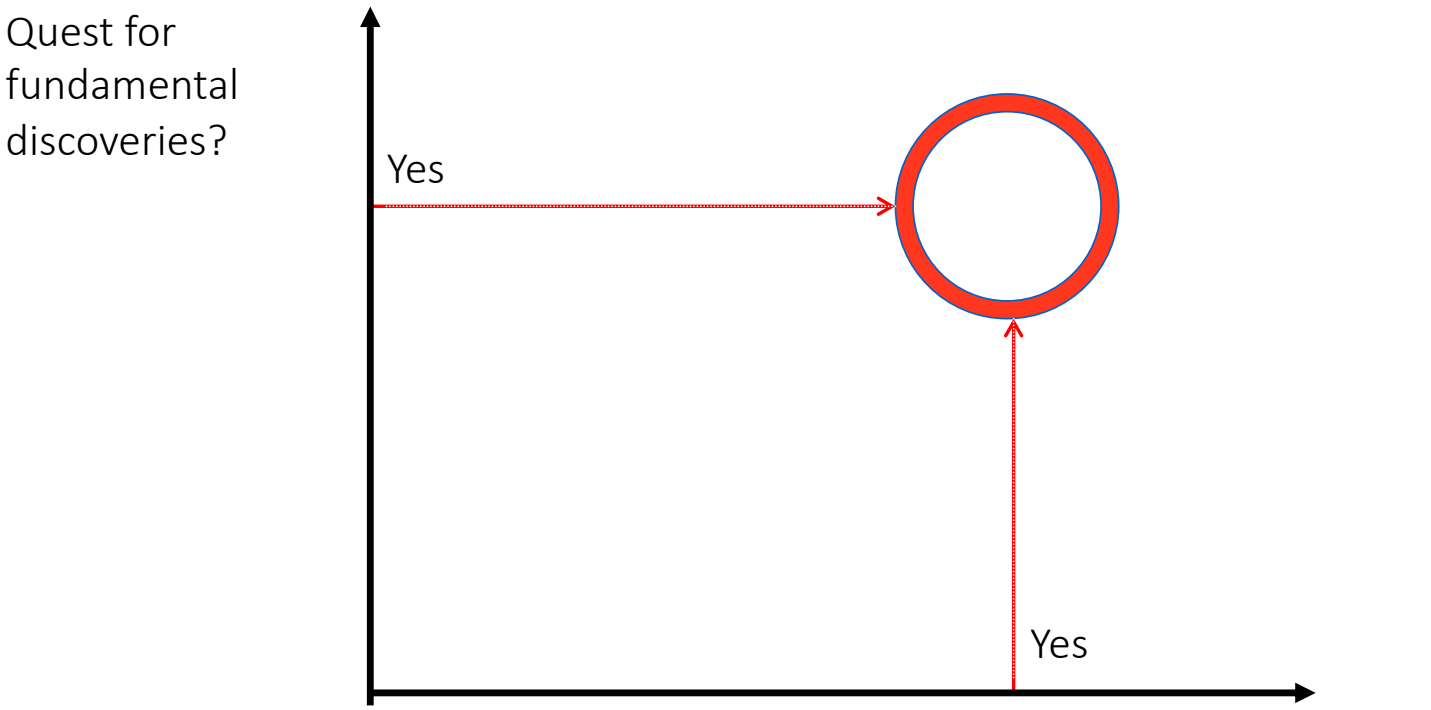


Fundamental
Autonomous
Curiosity-driven
Pure science

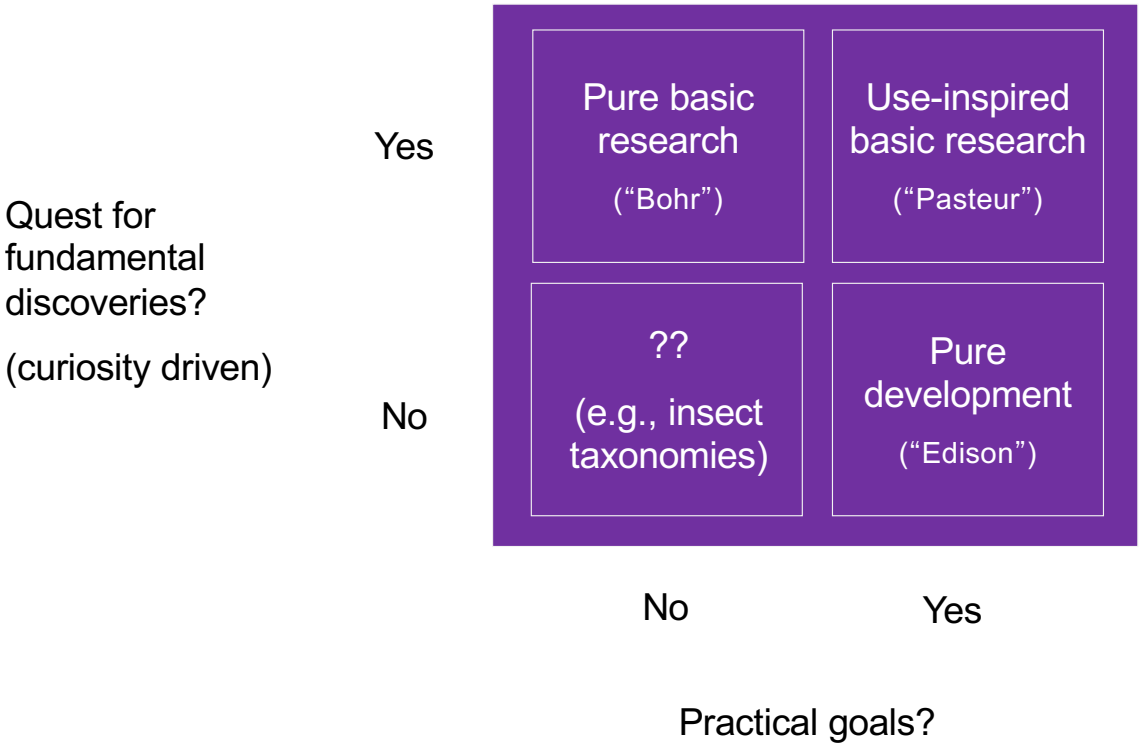
Applied
Practical
Mission-driven
Product development
(Firms)

‘FUNDAMENTAL’ vs. ‘APPLIED’ IS A FALSE DICHOTOMY

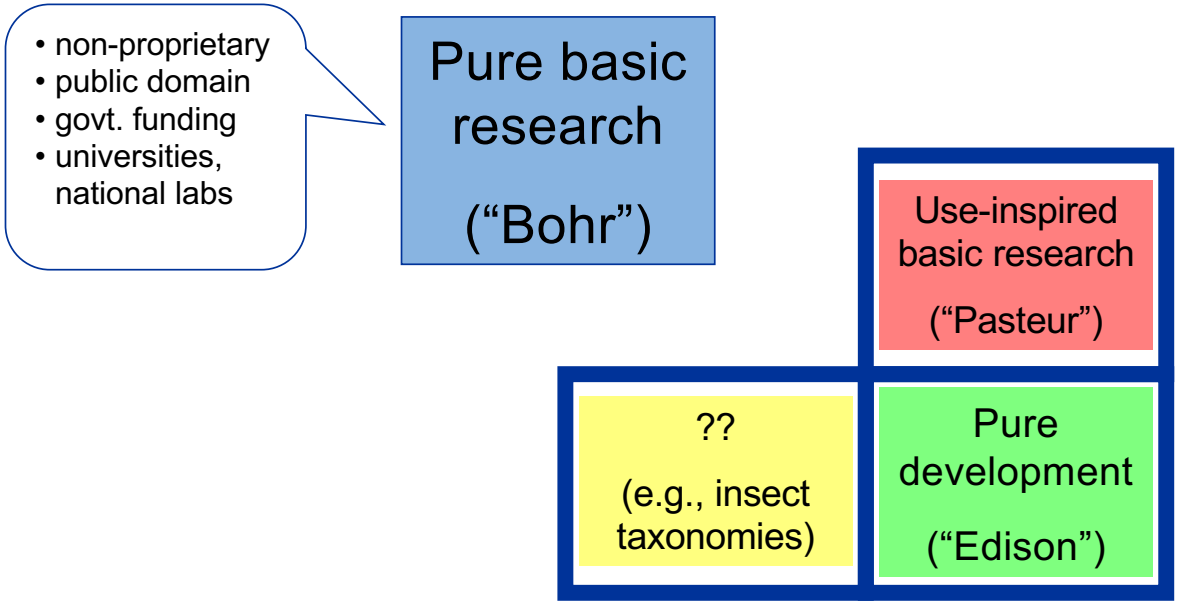
Both motivations may apply simultaneously



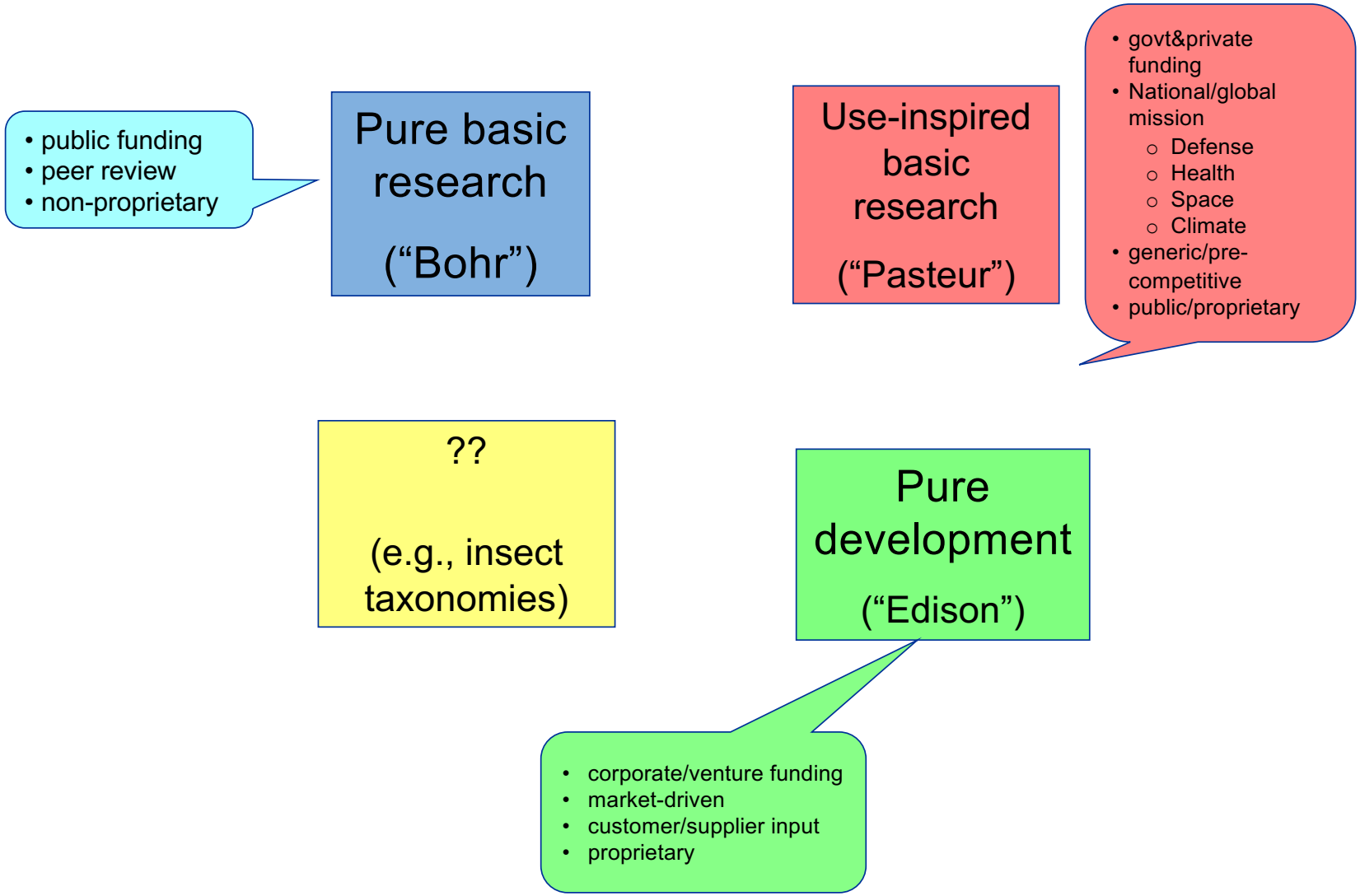
Stokes' matrix



Funding, selection, and IP ownership differ for each quadrant



(Stokes 1997; Lester)



(Stokes 1997; Lester)

In practice the distinctions are blurred

Any given innovation typically involves a network of organizations

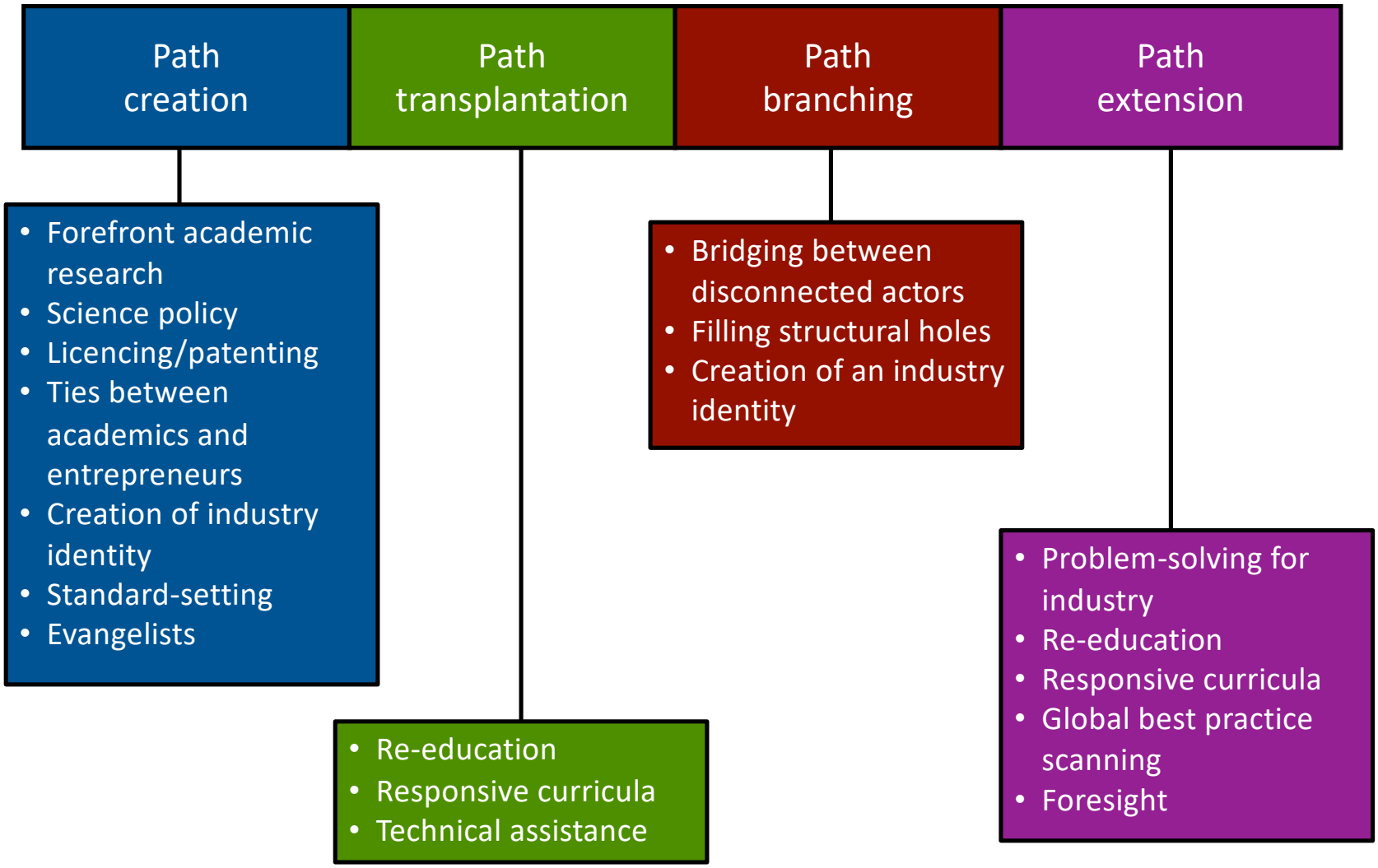
Universities are active in all quadrants

(Stokes 1997; Lester)

LIS Case Portfolio

Country	Location	Industry/technology
USA	Rocheeter, NY	Opto-electronice
USA	Akron, OH,	Advanced polymers
USA	Allentown, PA	Opto-electronice/eteel
USA	Boeton, MA	Bioinformatice
USA	New Haven, CT	Biotechnology
USA	Charlotte, NC	Motor sports
USA	I-85 Corridor, NC/SC	Autoe
USA	Alfred-Corning	Ceramice
USA	Youngetown, OH	Steel/autoe
Finland	Tampere	Industrial machinery
Finland	Turku	Biotechnology
Finland	Seinajoki	Industrial automation
Finland	Pori	Industrial automation
Finland	Heleinki	Wirelese
Finland	Oulu	Medical
UK	Central Scotland	Opto-electronice
UK	Aberdeen	Oil and gae
UK	Cambridge	Bioinformatice
Taiwan	Taipei-Heinchu	Electronice
Taiwan	Taipei-Heinchu	Software
Japan	Hamamatsu	Opto-electronice
Japan	Kyoto	Electronice
Norway	Stavanger	Oil and gae

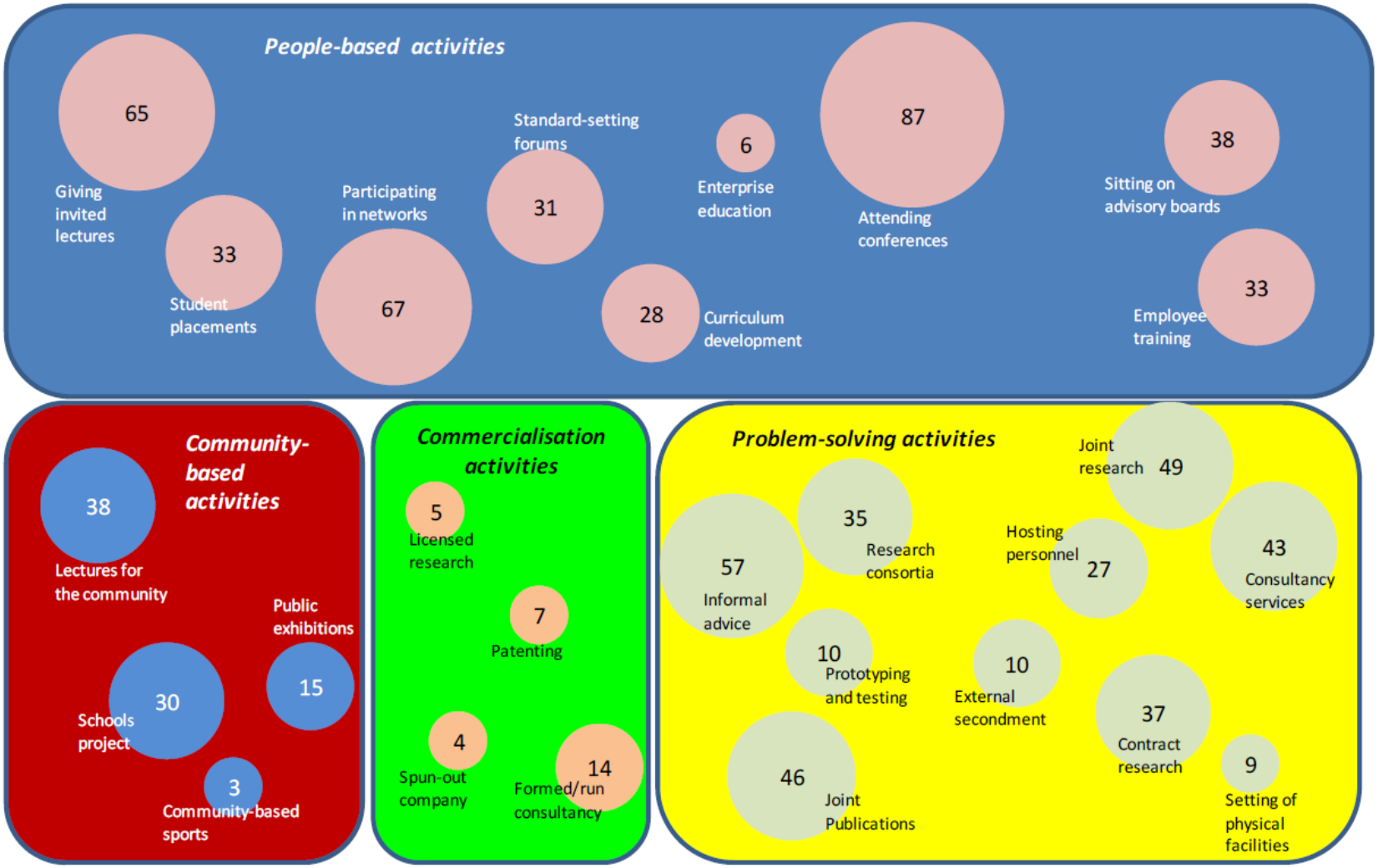
University roles in path development



Types of university–industry relations

(see Bercovitz &Feldman 2006; Mansfield 1995; Louis et al. 1989; Perkman et al. 2011; Martinelli, A., M. Meyer, N. von Tunzelmann 2008)

- **Licensing**: Contractual assignment of university-generated intellectual property (such as patents) to external organizations
- **Academic entrepreneurship**: Development and commercial exploitation of technologies pursued by academic inventors through a company they (partly) own
- **Research student**: businesses sponsor individual student.
- **Collaborative research**: Research jointly pursued by university and industrial partners – commonly with public funding
- **Contract research**: Application-oriented research and development activities carried out by university – commissioned and funded by industry
- **Consulting**: Application-oriented research and development activities or advice provided individually by academics – commissioned and funded by industry



Source: Hughes and Kitson (2012)

Universities and Different Forms of Knowledge

(Charles 2006)

Knowledge as a Commodity

- technology transfer and spin-off firms
- a number of mechanisms and policies were developed for enhancing the commercialization process

Knowledge as Human Capital

- education of students and training activities for people already in work
- the human infrastructure and the institutional mechanisms that foster interactive learning: reproduction and adaptation

Knowledge as Social Capital

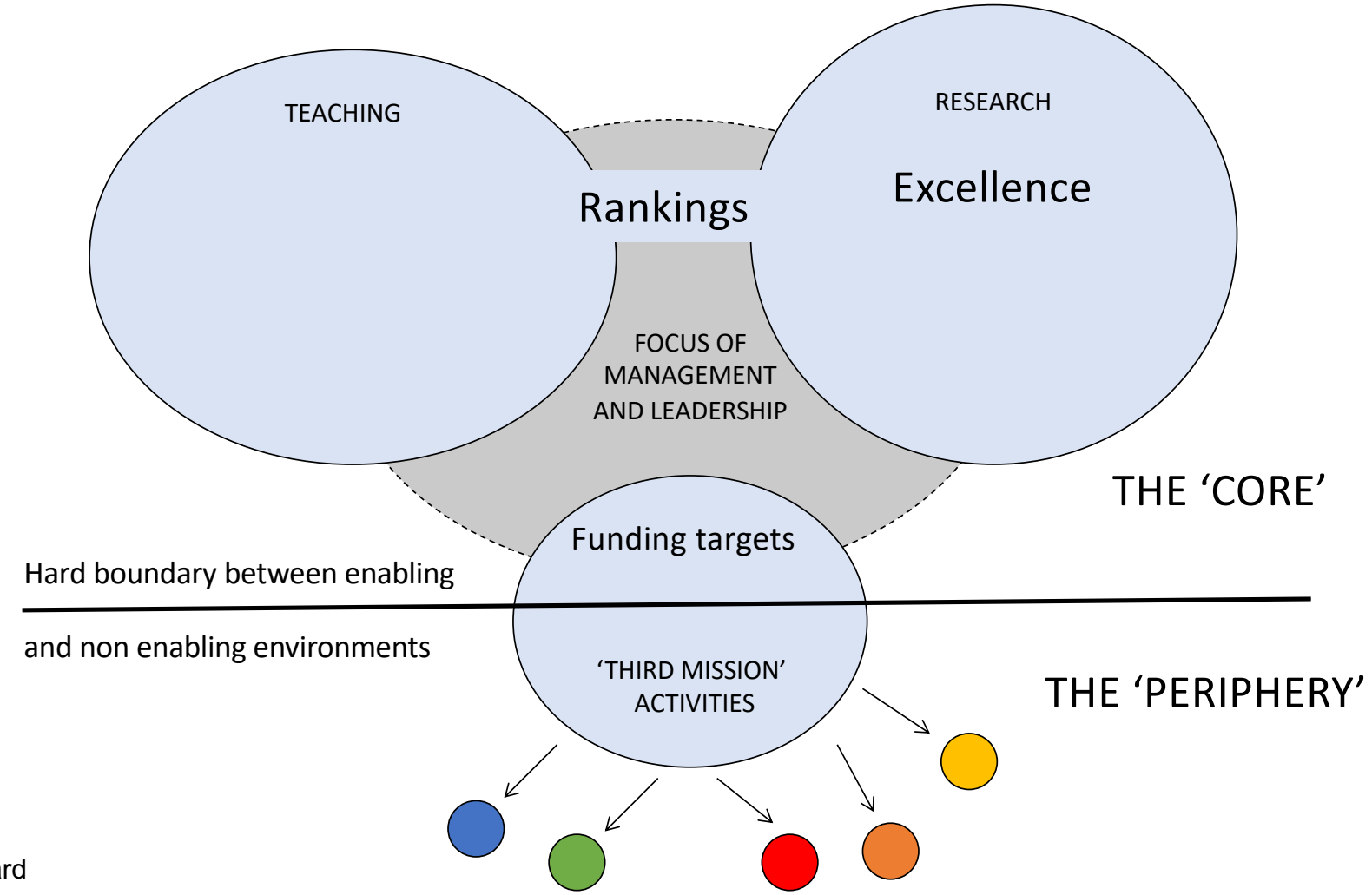
- the social and cultural basis of effective democratic governance and, ultimately, economic success
- The development of networks of civic engagement, and hence in the wider political and cultural leadership of their localities

The Civic University Model

- Not only what universities are good at but also **what they are good for**
- UTA (TAU) as a case in point

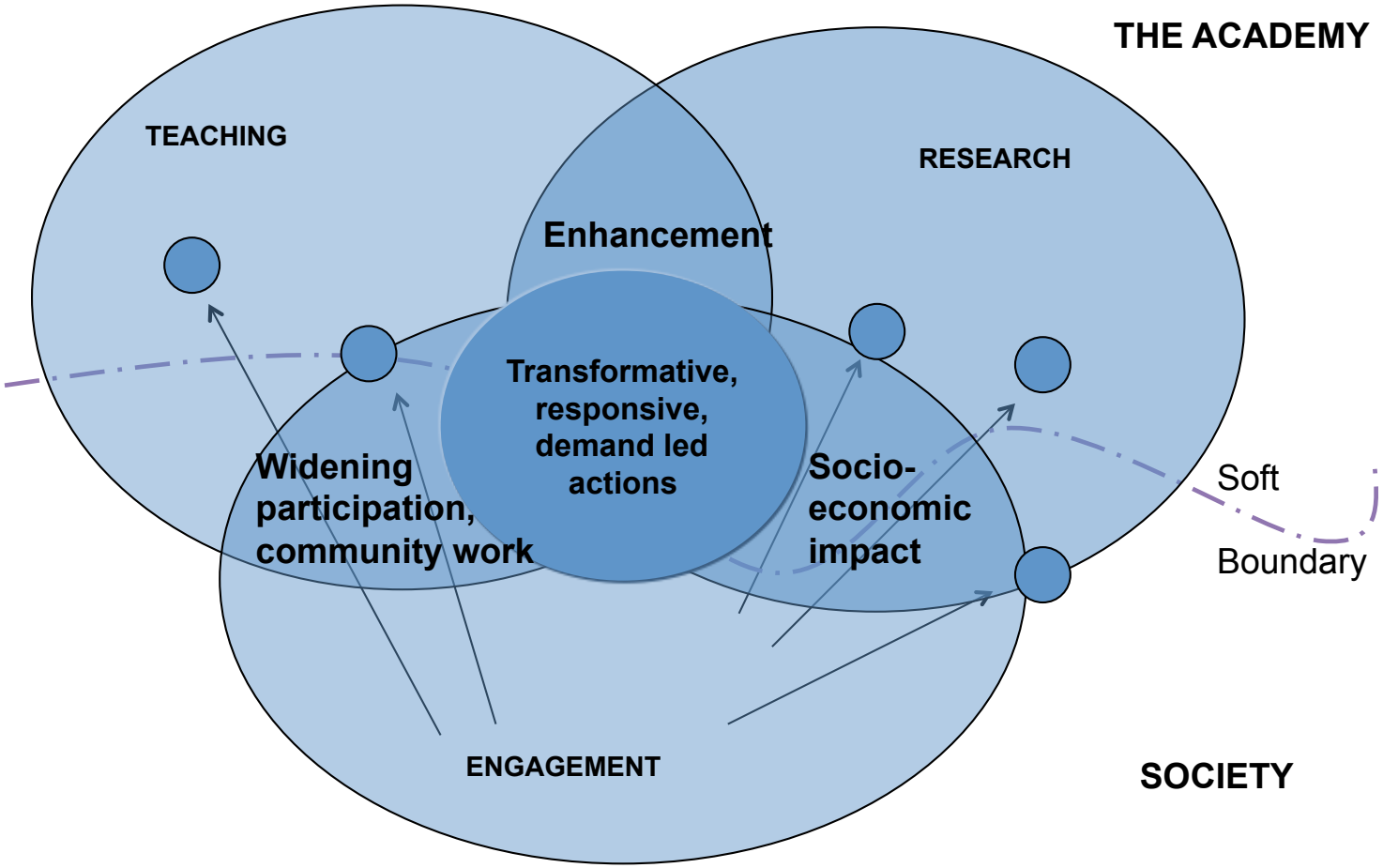
- A sense of purpose
- Actively engaged
- A holistic approach
- A strong sense of place
- Willing to invest
- Transparent and accountable
- Use of innovative methodologies

The ‘un-civic’ university



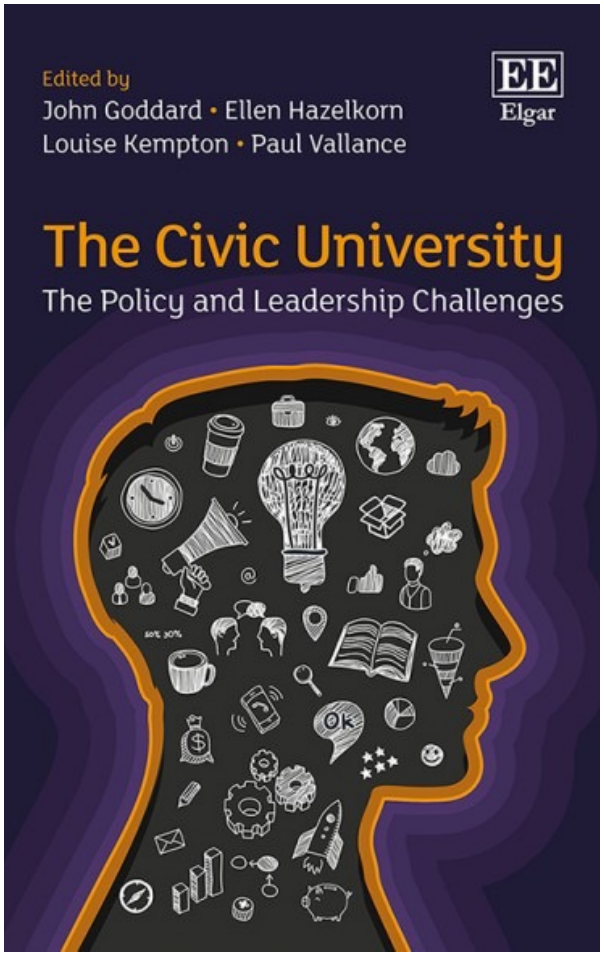
By John Goddard

The Civic University



By John Goddard

Chapter 6 - Sotarauta: Leading a fundamentally detuned choir: University of Tampere, Finland – a civic university?



The University of Tampere was a civic university according to its history, internal culture and values but it did not systematically develope itself as such

- A long history as a 'civic university', civic engagement has been seen as a natural part of activities
- The concept of civic engagement is not formalised or officially embedded in the strategy
- The partnerships are not managed strategically and holistically
- 'The civic nature' has been taken for granted and development efforts have thus targeted other issues
- NOTE: Are we today building an entrepreneurial university?

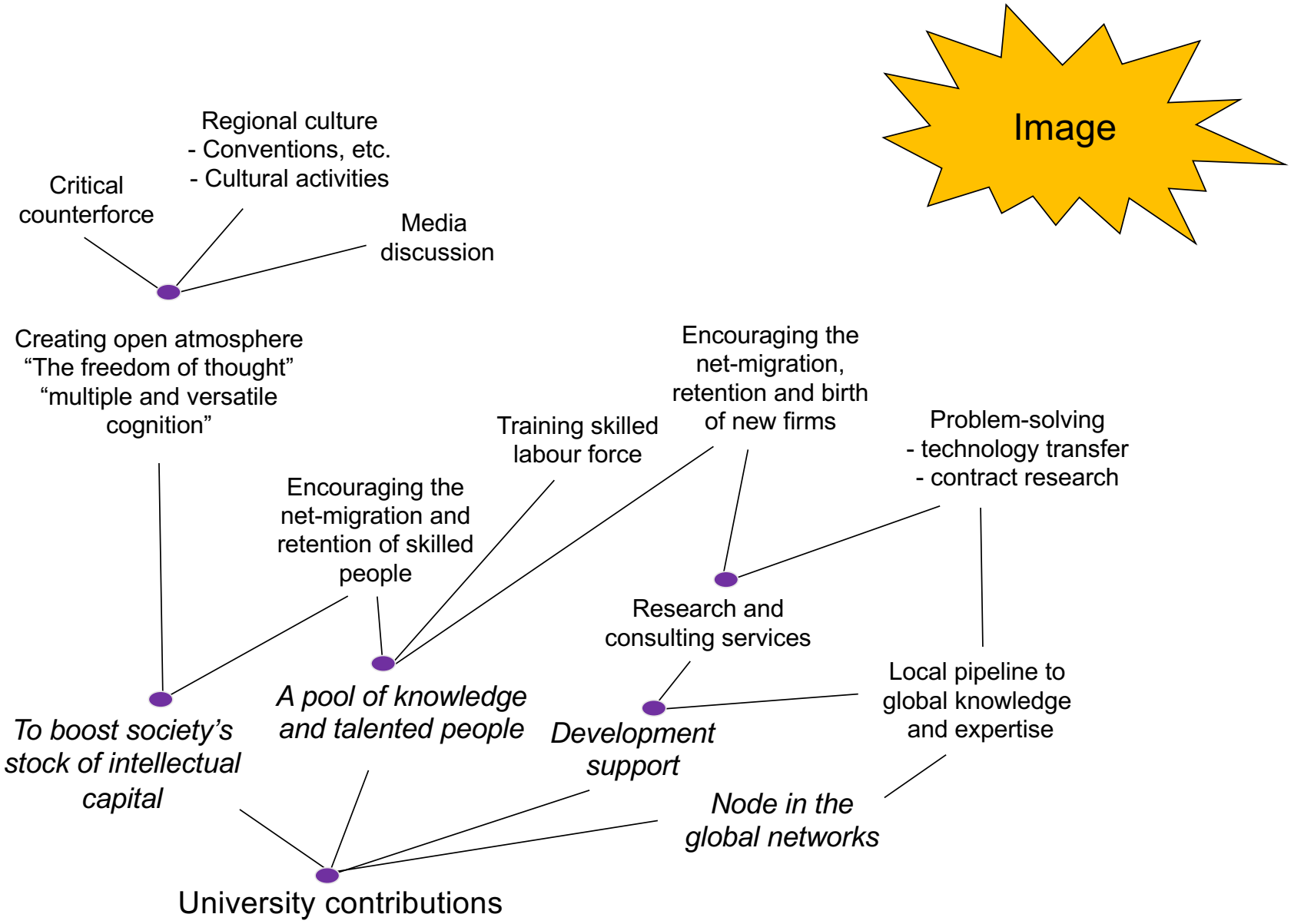


Image
Regional culture
- Conventions, etc.
- Cultural activities
Critical counterforce
Media discussion
Creating open atmosphere
“The freedom of thought”
“multiple and versatile cognition”
Encouraging the net-migration, retention and birth of new firms
Training skilled labour force
Problem-solving
- technology transfer
- contract research
Encouraging the net-migration and retention of skilled people
Research and consulting services
Local pipeline to global knowledge and expertise
To boost society’s stock of intellectual capital
A pool of knowledge and talented people
Development support
Node in the global networks
University contributions

That’s it – thank you for patience

Enjoy holiday season but not yet