Methodologies of quadruple helix analysis

Workshop:

Measuring quadruple helix connectivity:
Towards a strategy for smart regional governance

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Analysis for what?

Regional specialization scope (what knowledge base, what industry, what innovations):

- **Identification of areas of actual or potential competitive advantage**
- **Selection of prioritized specializations**

Strategic process scope (leadership, alignment of interests, governance):

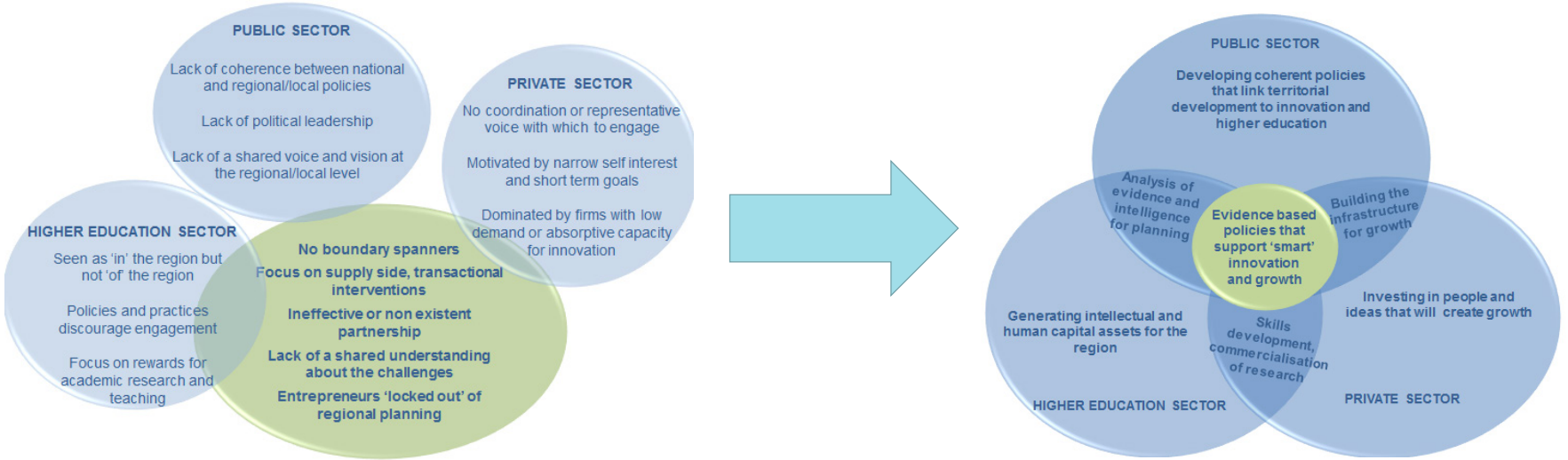
- **Inclusion of relevant actors**
- **Policy alignment**
- **Partnership establishment and effectiveness**
- **Development of social capital**

Micro-level connections scope (clustering, knowledge transfer, innovation processes, ..):

- **Embedding of knowledge and knowledge relations in and between actors**

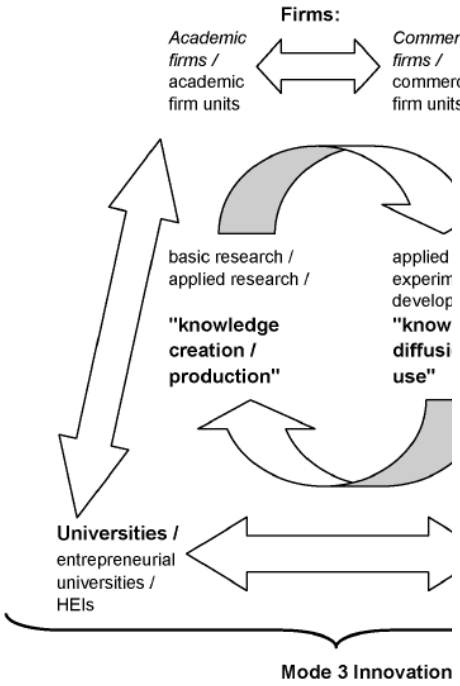
Situation, target and transformation can be analyzed

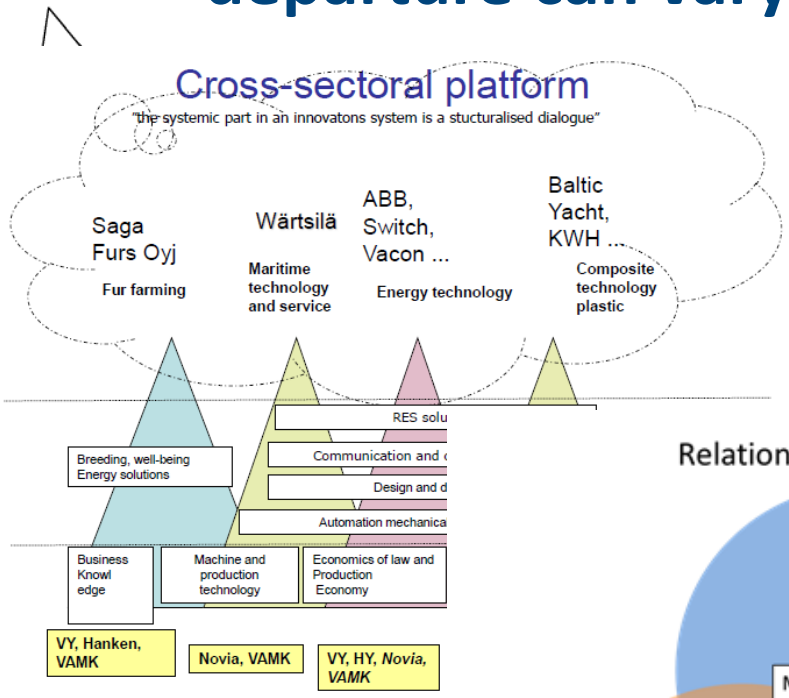
- **Triple helix example of characteristics of disconnected and connected regions**

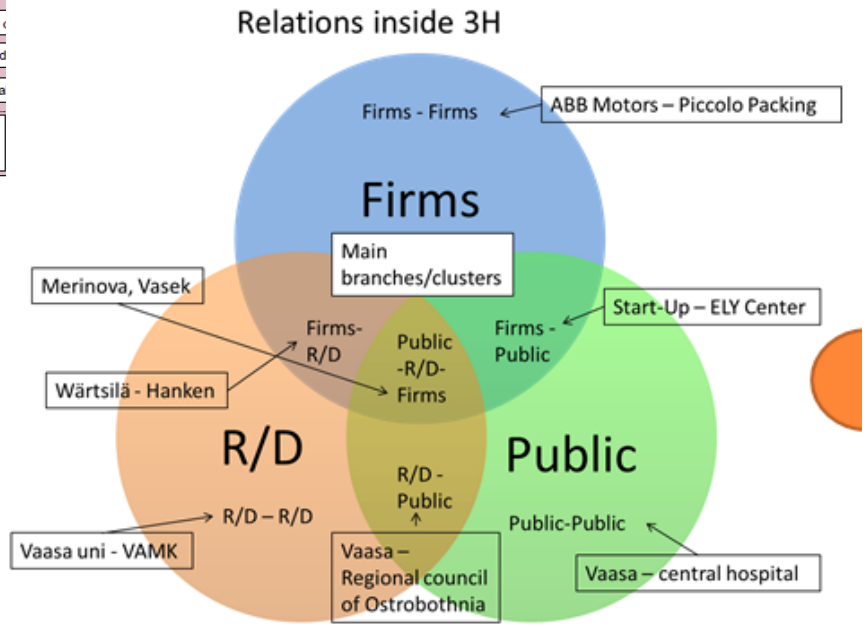


source for both figures: CURDS

Conceptualizations and points of departure can vary







Sources: Carayannis and Campbell (2009); Johnson (2013); Takala (2013)

Scope of this presentation

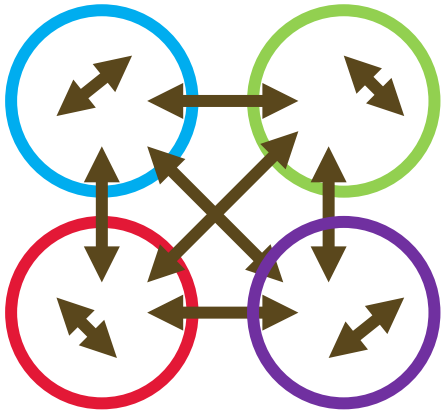
- Focus here on connectivity between the four sectors of a quadruple helix setting (boundary spanning)
- Primarily interpreted as connections between organizations (Etzkowitz)
- Secondarily interpreted as signs of restructuration of functions in a complex system (Leydesdorff)
- No overview of statistical techniques etc.

What to monitor in a RIS3 project, and why

- Determine the problem to be addressed
- Develop an understanding of what changes could cause an improvement, a chain of reasoning about outcomes (a "theory of change")
- If it involves changing the behavior of people or institutions, develop an understanding of what measures could be taken for them to change their behavior (a "theory of action")
- Put it together as a "program theory" for your Smart Specialization program
- Select observable points in this dynamic theory that are crucial to progress
- Set targets and monitoring schemes for these points
- Then develop indicators and start measuring

Connection level: Data on relations

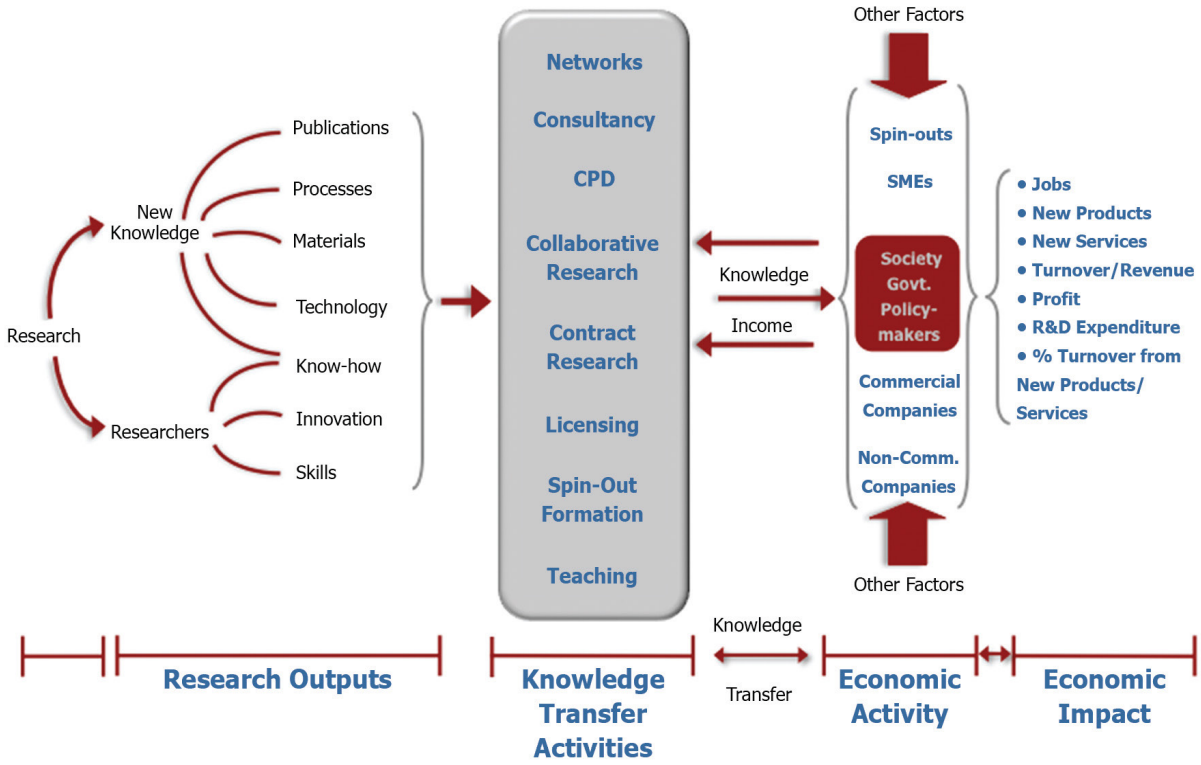
- Connections essential in all conceptualizations, but they may differ in contents
- 1a. Develop a survey to map current and desirable connections
  - 2a. Select a strategic sample of significant informants with an overview (not suitable for statistical generalizations)
  - 2b. Or select a much larger random sample
- 1b. Or use existing data sources
- Use data to draw maps of structure of connections or communication
- Aggregate or reduce to ten (14) sets of connections within and between the four types of institutions (sectors)
- Are some connections or groups of connections more important than others?



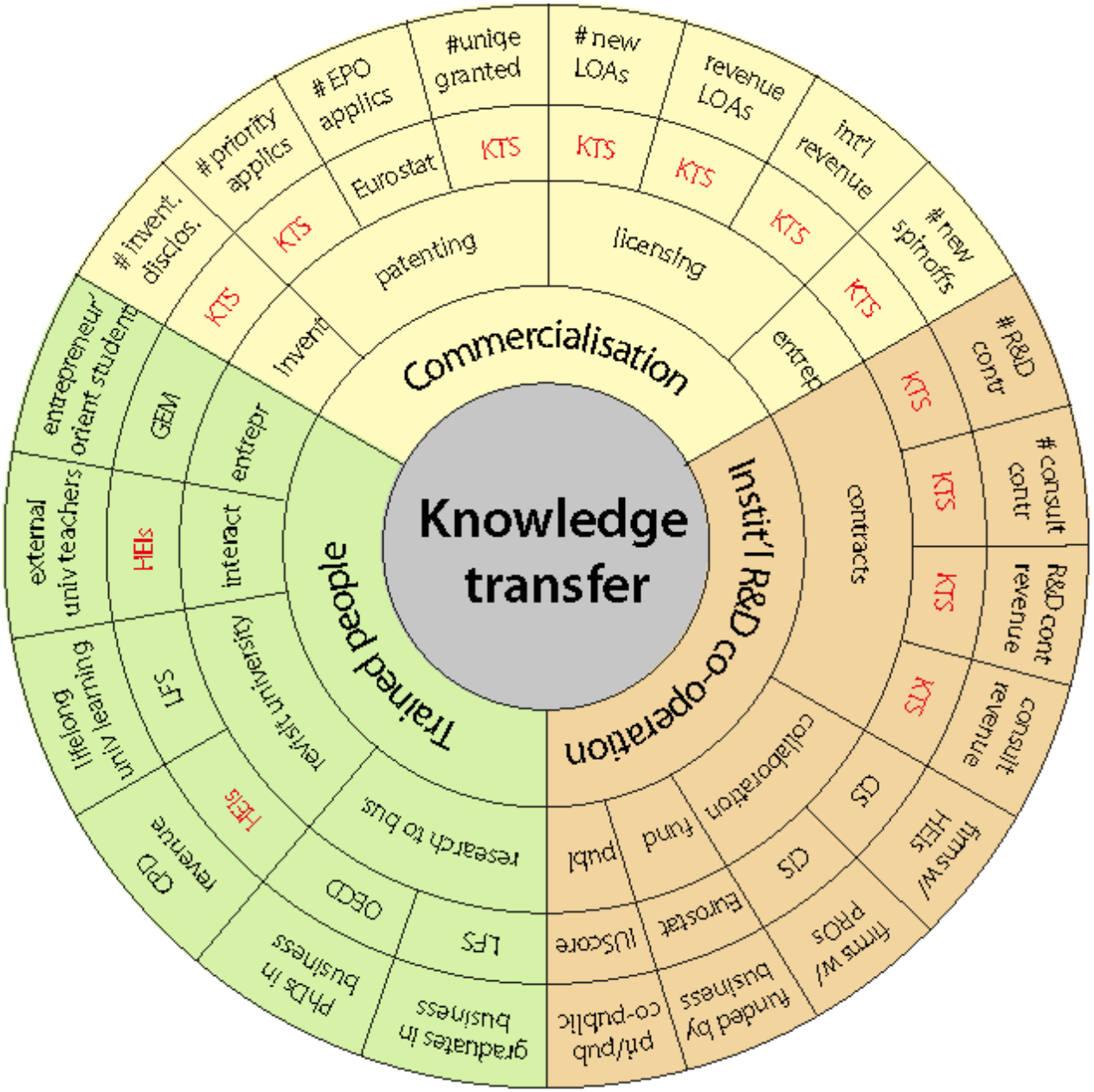
Example: Knowledge transfer in smart specialization

- Smart specialization strategies frequently involve improving connections between R&D institutions and firms in the region
- Earlier, focus on technology transfer
- Now, a somewhat broader concept of knowledge transfer
- More sophisticated models, an understanding of new knowledge as co-generated and innovation as complex interaction processes
- Increasing awareness of the need to work on bridging the gaps between epistemic cultures, strategic orientations, and forms of practice of universities and business
- In other words, much more at stake than improving the market for new knowledge

A model for understanding knowledge transfer activities



Source: Holi *et al.* (2008) p. 2; attributed to Kevin Cullen of Glasgow University



A composite indicator for knowledge transfer

Data sources for national indicator sets

KTS: knowledge transfer survey
CIS: community innovation survey
LFS: labour force survey
GEM: global entrepreneurship monitor
IUScore: innovation union scoreboard
HEI: higher education institution
Eurostat
OECD

Where data sources are marked in red, substantial amounts of data are missing for constructing national indicators on a European scale, but some may be available in your region

Other abbreviations
LOA: licence, option, assignment
PRO: public research organization
CPD: continued professional development

Source: Finne et al. (2011)

System level: Institutions, functions, and trajectories

- Original triple helix formulation (Etzkowitz and Leydesdorff) based on the observed benefits of overcoming the fragmentation induced by specialization of two functions between two institutional sectors:
  - New knowledge was produced in universities
  - Innovations were produced in firms, and those that were selected in markets, led to economic growth
  - However, much of the new knowledge from universities was never implemented or only very slowly in the business sector
- Government was in a position to regulate the relations between universities and firms in order to improve on the random spillover process for new knowledge potentially beneficial to economic growth
- However, a stable linkage of three institutional spheres with different spiralling development logics is difficult, particularly when they also start performing each others' functions

Crossover of functions – examples

- R&D labs in industry produce knowledge and provide sources of innovation
- "The industry university" nearly established in Norway some years ago
- Public institutions become clearing houses for scientific knowledge (to induce evidence based practices in public services)
- Public institutions and research institutes compete over the same funding
- Public services compete with private services
- Universities compete with consultancy firms over government contracts
- Government agencies switch from using researchers to consultants for studies
- Firms and universities in many cases self-regulate their interactions through various bonding practices (professorship donations, framework agreements, secondments, ...)

Stabilizing or destabilizing of systems

- Signs of chaos, or signs of realignment of functions?
- Smart specialization: a strategy for partial realignment of functions resulting in new market/knowledge co-evolutionary trajectories (lock-ins) embedded in practices and institutions in a region
- Co-evolutions between technological developments and their cognitive and institutional environments change the knowledge infrastructure
- Market selections, innovative dynamics, and network controls operate on these configurations; negotiations and translations at the interfaces induce adaptation mechanisms in the institutional arrangements
- Integration among the functions of wealth creation, knowledge production, and normative control takes place at the interfaces in organizations, while exchanges on the market, scholarly communication in knowledge production, and political discourse tend to differentiate globally

Sources of alternative formulations: Leydesdorff 2000; 2013

Consequences

- In a 4H setting, it is difficult to work with institutions because they partly are oriented far away from each other and partly have too overlapping and conflicting interests ...
- ... but it is even more difficult to work with functions because these don't have anyone to speak for them ...
- ... and frequently much effort goes into getting out of lock-ins between resources and practices that no longer include markets

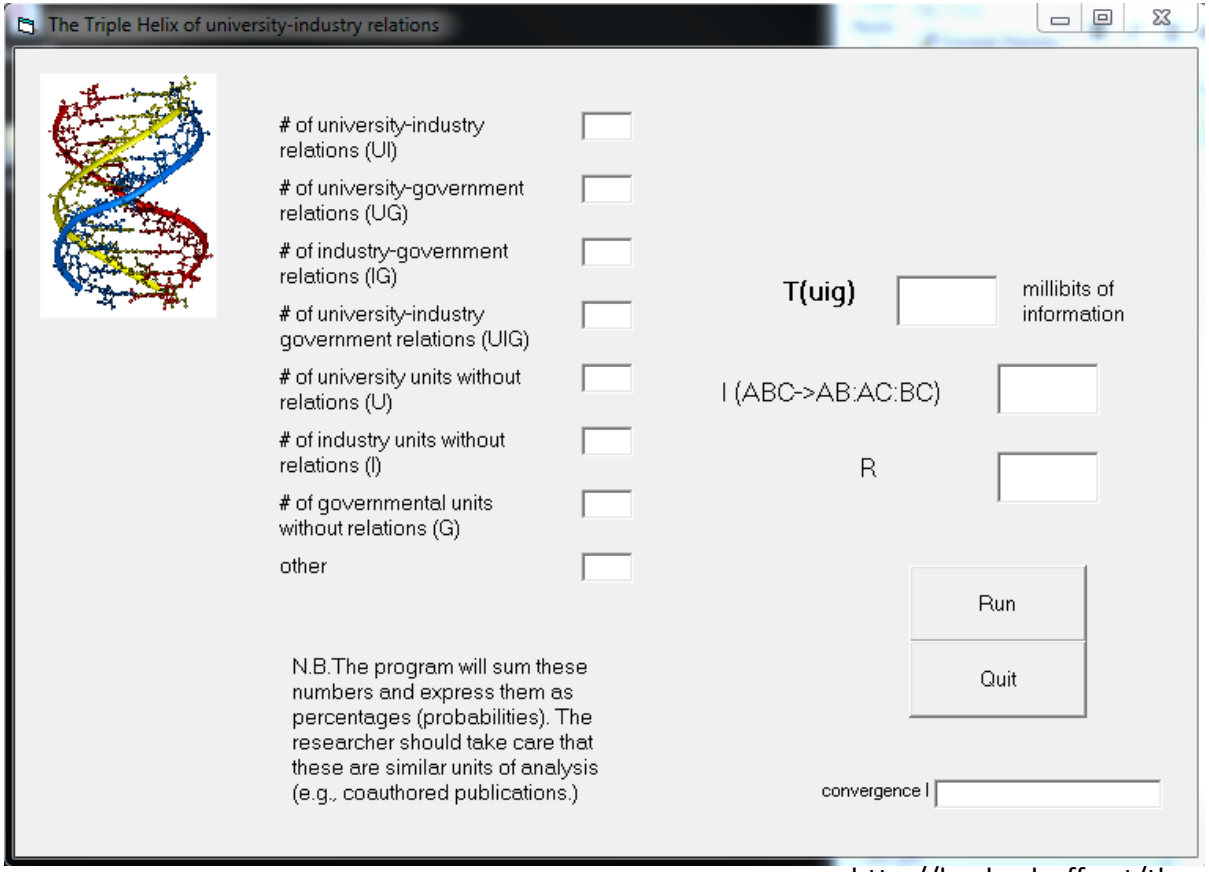
- Leydesdorff's type of configurational analysis of how, in a successful system, its functions (wealth creation, knowledge production, regulation) are embedded in practices distributed over interfaces rather than hierarchically distributed between institutions (or: government doesn't govern alone) – should not be dismissed
- What functions do the fourth helix bring to the system? What do the public want back?

Why would institutions in one sphere care about institutions in the others, anyway? [tentative!]

	Industry	Universities	Government	Public
1st function	wealth creation	research/ teaching	normative control	quality of life
2nd function (3H main position?)	innovation	novelty	regulation (including funding)	(interests)
ethos, "currency"	money	truth	public service	multiple?
4H main position (??)	commerciali-zation?	integrate knowledge flows?	structuration or facilitation	social innovation? expansion of domains? reconfiguration?

Leydesdorff's triple helix calculator

- Converts probability distributions of interactions into configurational data using entropy concepts
- Also a 4H version
- Difficult to configure meaningful operationalizations
- Difficult to interpret results
- But don't dismiss!



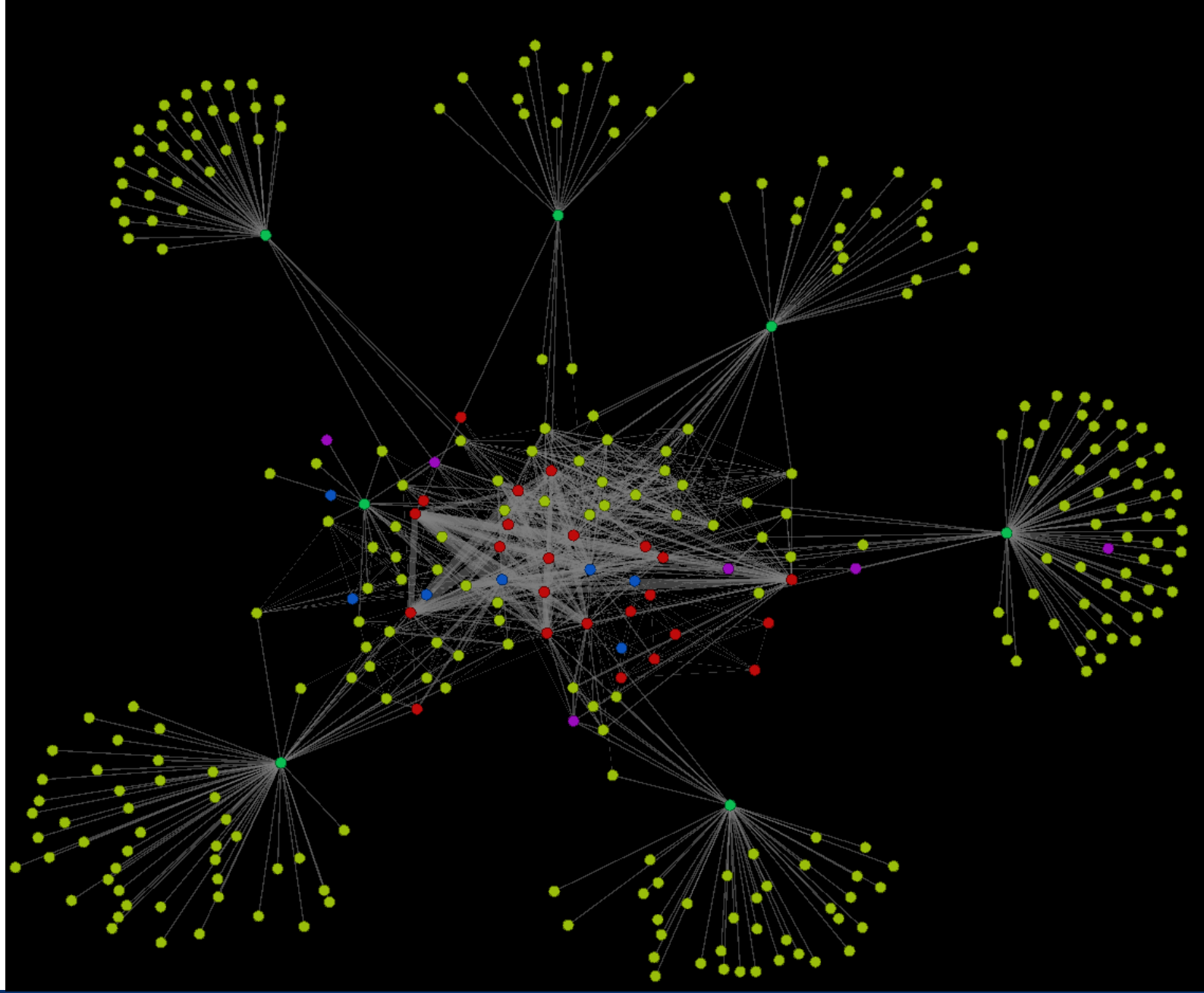
source: http://leydesdorff.net/th

Configurational and relational analysis by other means

- Exploratory data analysis through visualization
- Network analysis software
  - Identify patterns of linkages
  - May use the same tool for working with structures, functions, semantics, ...
  - Visual pattern matching supported by calculations of concentration, connectedness, stability over time, ..., in territorial or abstract spaces
  - Zoom in for detail, zoom out for overview

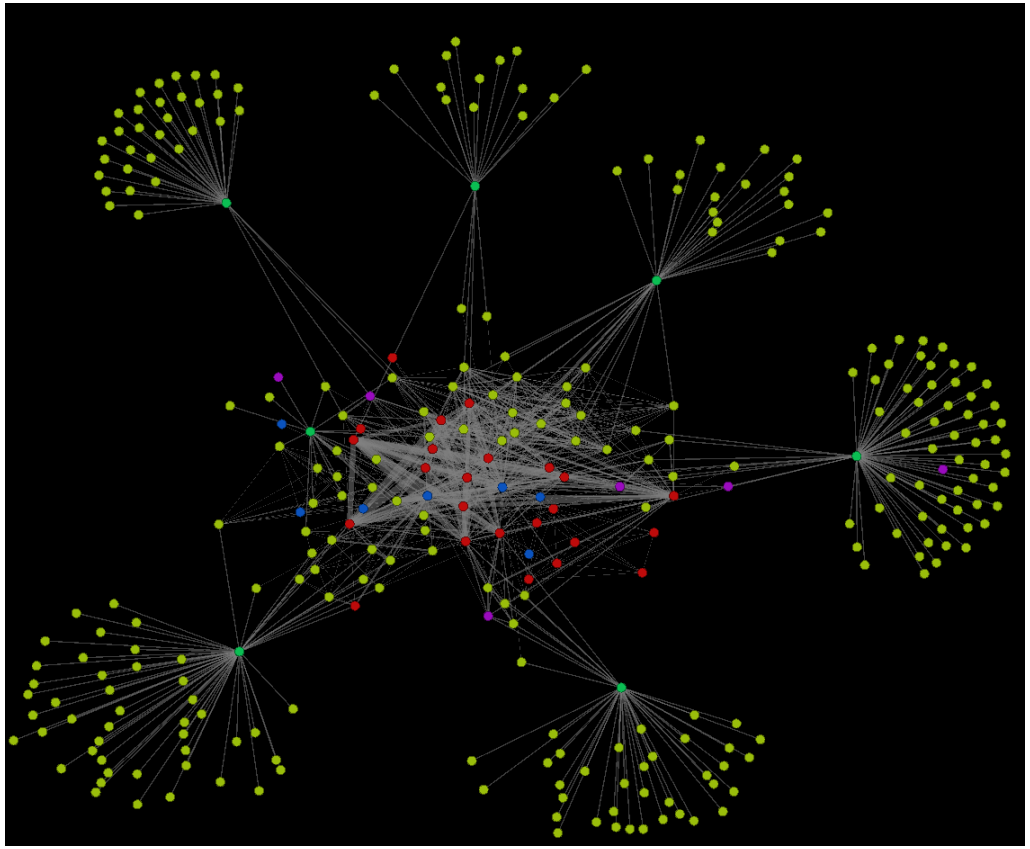
Connectivity in a regional quadruple helix development project after 2 years

(source: SINTEF work in progress)



Visualizations can help identify links and configurations

- Ideas more easily find executors in dense networks
- Innovation is recombination of known elements
- Trust is transitive in social networks
- Identify structural holes that it might be beneficial to span



Concluding words

- Rule # 1 is a clear understanding of what you want to measure and why
- In methodology, anything goes (Feyerabend)
- But not everything goes!
- And even scientists have to be convinced to accept scientific findings!
- To enhance boundary-spanning activities may require methodologies that are accepted in different communities
- Numbers are often required, but not always, and not always accepted
- Interactive visual instruments are a promising tool for developing understandings jointly across epistemic boundaries

- I hope I have drawn your attention to that.
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