

RISIS



KNOWMAK: A new tool for exploring Knowledge Production in the ERA

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fteval inside : fteval insight
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Outline

- 1) General introduction of the KNOWMAK tool
 - a. A focus on indicators of knowledge production and three integrative dimensions
 - b. KNOWMAK source data, basic architecture of the infrastructure, and indicators

- 2) Exploring the tool and its functionalities
 - a. The interactive KNOWMAK dashboard
 - b. Exploration and discussion

Background

- New **knowledge** as essential driver for **innovation**
 - Of crucial importance for the **socio-economic development** of organisations, regions and countries
- **Increasing interest** in the scientific but also the policy realm to empirically grasp **knowledge production** and its dynamics across different
- Geographical and topical spaces, and
 - Derived from organisation-level knowledge production activities

Motivation: Why KNOWMAK?

- Increasing **complexity** of knowledge production challenges existing tools on knowledge production
- Need to move beyond static indicators and classification schemes towards **dynamic and user-oriented indicators**
- Make these indicators **publicly available** in a robust and effective way for different user groups within a **user-friendly online working space**

The objectives of KNOWMAK

- Develop an interactive tool to **observe, visualise** and **investigate** '*Knowledge in the Making*' in the ERA
 - with a focus on knowledge related to *Societal Grand Challenges (SGC)* and *Key Enabling Technologies (KET)*
- provide a radically improved information basis in form of indicators on SGC and KET knowledge production
- activities (hot spots) and interactions (networks)
 - derived from data on organisations

With our indicators focus, the tool allows...

- To explore geographical spaces of knowledge production
 - Countries and regions
 - Looking into regional actors (HEIs, PROs, firms)
- To explore topics of knowledge production
 - KET/SGC and their subclasses
- To combine different types of data
 - Established: publications, patents, projects.
 - New: social innovation projects and citizens' attention based on social media
- To visualize knowledge production
 - Through interactive and customizable visualization

What is new in comparison to existing tools?

- Integrating heterogeneous data by three integrative dimensions
 - To provide single views based on space/actors
 - To develop composite indicators and alternative views of knowledge production
- Linking policy topics to data by using ontologies
 - as a flexible approach to combine different types of sources in a single topical view
- Providing data on social innovation and user attention
 - Covering the realm of 'other' types of innovation, driven mostly by civil society organisations
 - Inquiring about the broader reach of science in society

The KNOWMAK integrative dimensions

The KNOWMAK integrative dimensions

- **Geographical Space** (by geocoding organisations)
- **Topics** (by tagging data items based on ontologies)
- **Actors** (by cross-harmonising organisation names)

are the key element discriminating the KNOWMAK tool from others

→ Enables the integrated and harmonised derivation of indicators across different source datasets

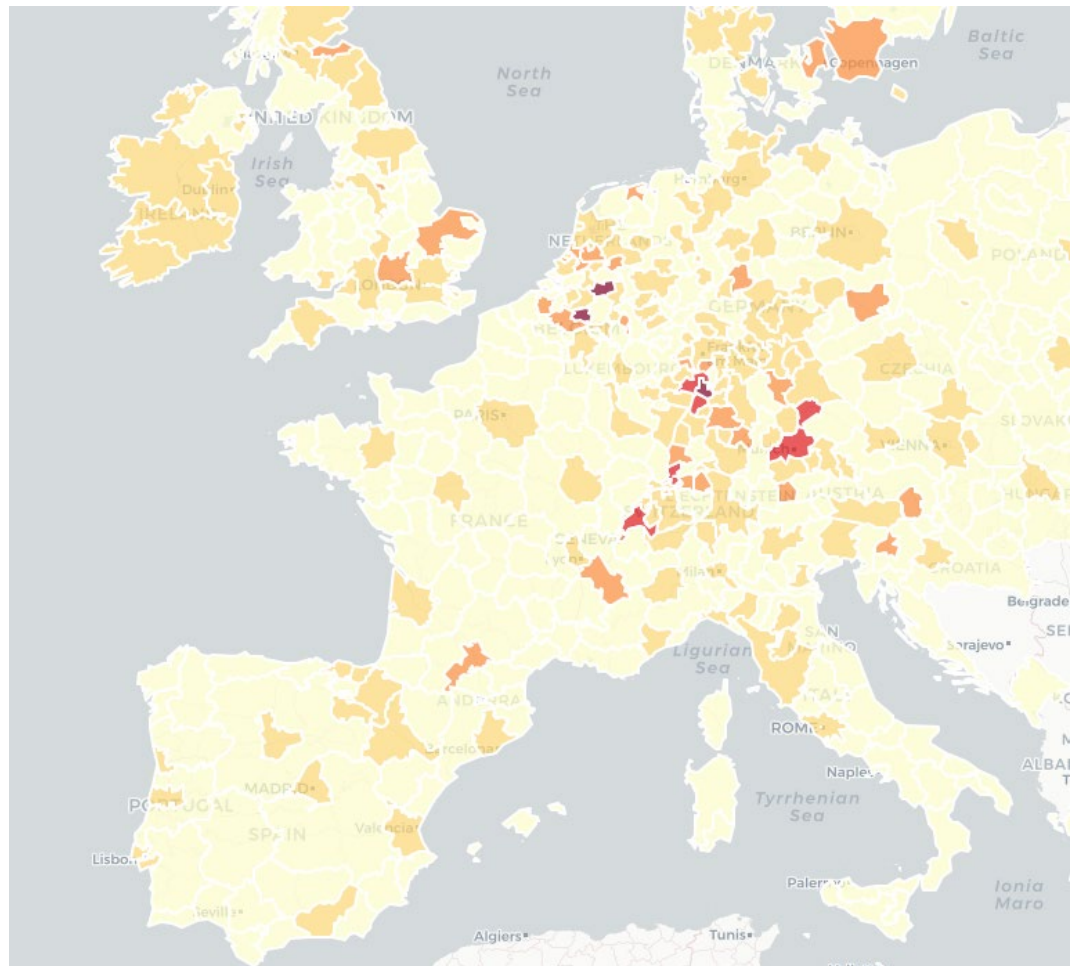
Space

- Countries
- Regions combining metropolitan areas and NUTS2/3 regions

You are able to

- Display and combine data and indicators
- View regional profiles

A spin-out of **RISIS** work on space and geolocalisation



Topics

- A fine-grained ontological structure (13 KET/SGC and around 150 subclasses)
- Keywords used to annotate data and to attribute them to classes to build indicators
- A very flexible approach in terms of policy questions *and* of structure of the data

KEY ENABLING TECHNOLOGY advanced manufacturing technology advanced materials industrial biotechnology micro- and nano-electronics nanoscience and technology optics and photonics SOCIETAL GRAND CHALLENGE bioeconomy climate change	MNE manufacturing advanced materials for manufacturing manufacturing biotechnology nanotechnologies for manufacturing photonics in manufacturing software for manufacturing	advanced design software for manufacturing logistics supporting software for manufacturing production supporting software
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Selected Class: http://www.gate.ac.uk/ns/ontologies/knowmak/amt_software

Software for manufacturing. AMT Software.

Related Keywords: amt software, cloud-based, custom, customised, customization, hardware, matlab, middleware, multimediuum, runtime, software for manufacturing, vendor, workflow

Actors

- Wide standardization of actors
 - Building on RISIS Orgreg and FirmReg
 - Covering HEIs (ETER+), PROs and in future firms
 - Extensive matching of actors with data sources
- Indicators derived from **actor-level information** (e.g. addresses)
- As a next step KNOWMAK will allow
 - Seeing actors in their regional context
 - Observing their contribution to knowledge production (by region)

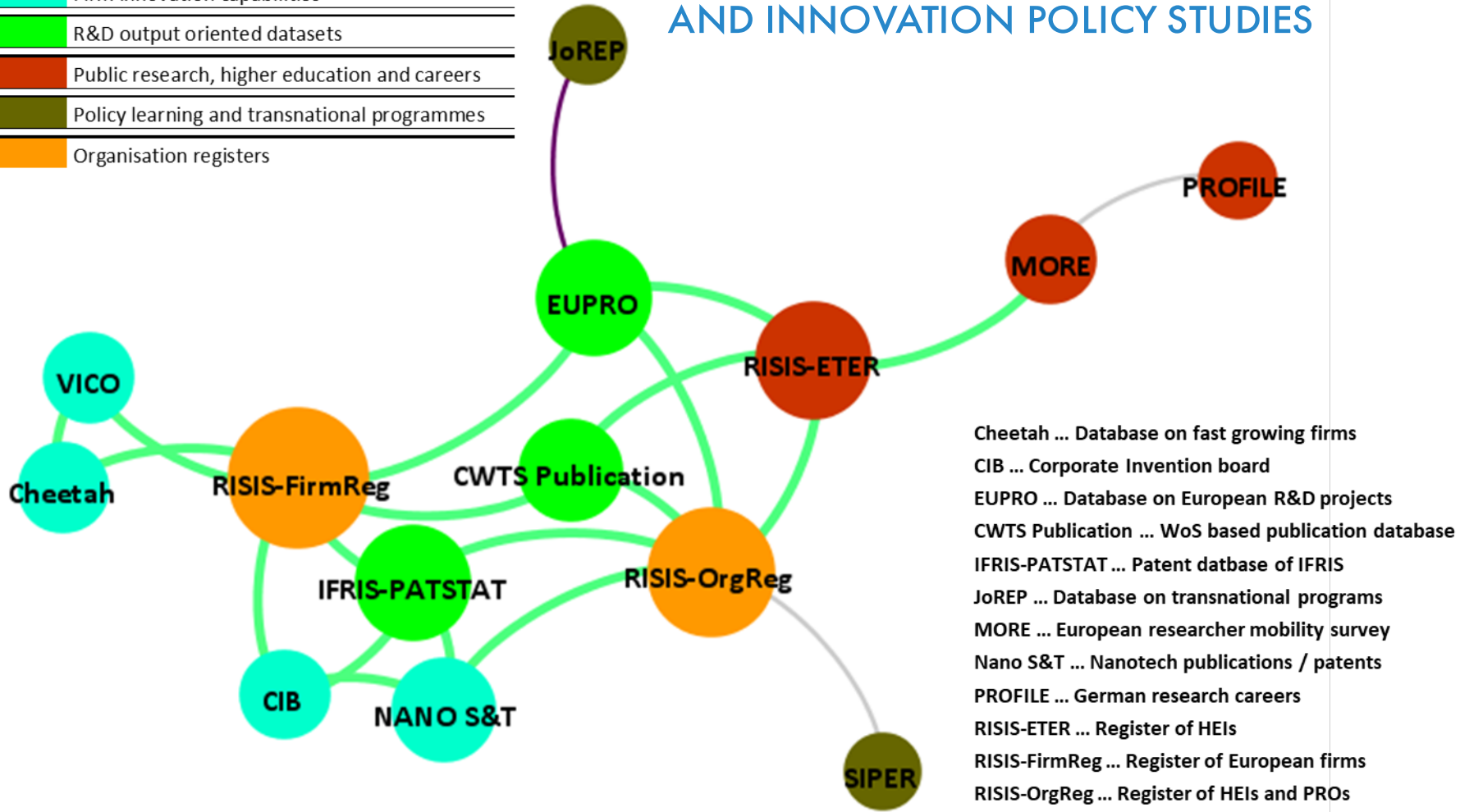
The RISIS context

RISIS



RESEARCH INFRASTRUCTURE FOR SCIENCE AND INNOVATION POLICY STUDIES





- Firm innovation capabilities
- R&D output oriented datasets
- Public research, higher education and careers
- Policy learning and transnational programmes
- Organisation registers



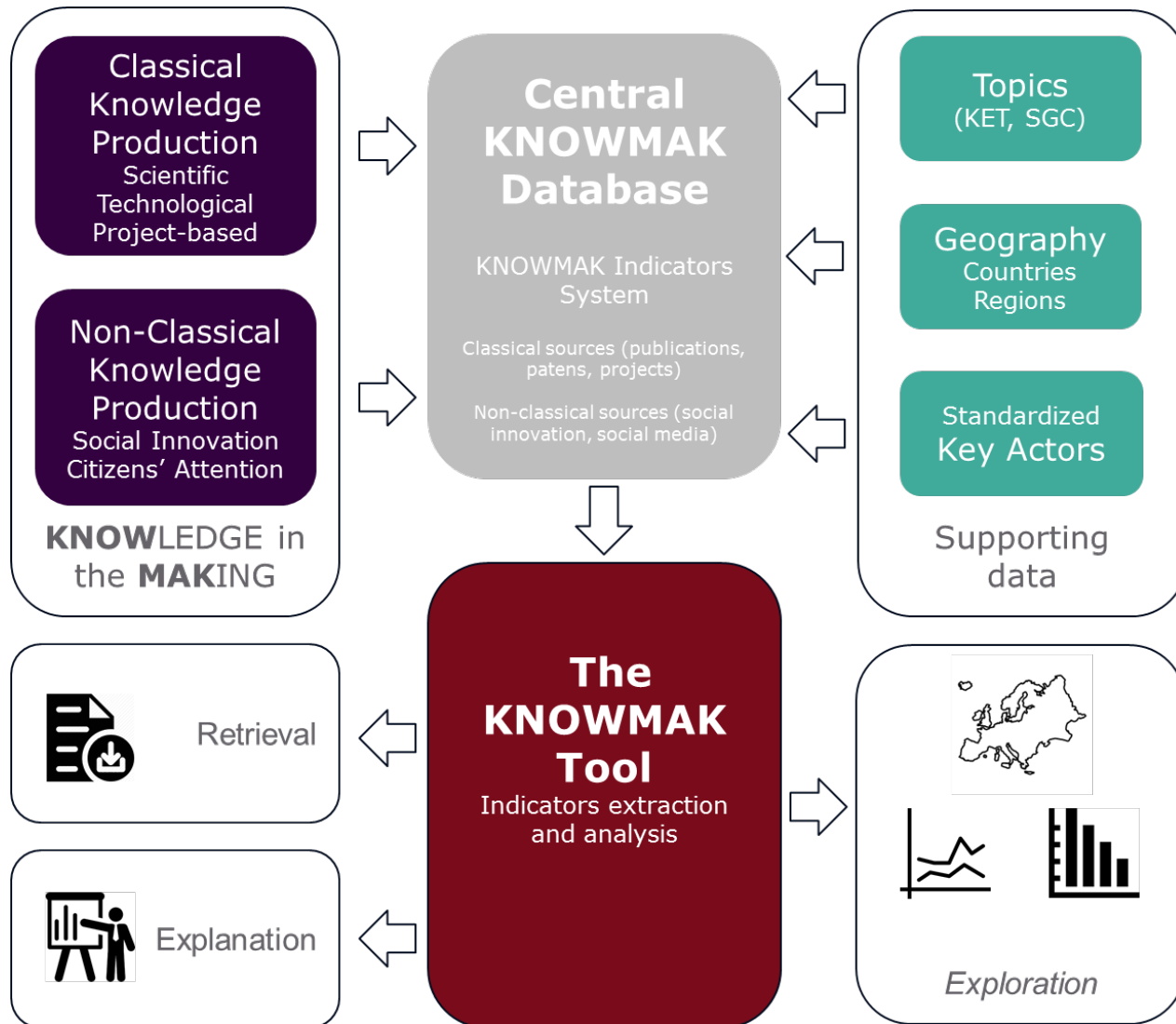
- Cheetah ... Database on fast growing firms
- CIB ... Corporate Invention board
- EUPRO ... Database on European R&D projects
- CWTS Publication ... WoS based publication database
- IFRIS-PATSTAT ... Patent database of IFRIS
- JoREP ... Database on transnational programs
- MORE ... European researcher mobility survey
- Nano S&T ... Nanotech publications / patents
- PROFILE ... German research careers
- RISIS-ETER ... Register of HEIs
- RISIS-FirmReg ... Register of European firms
- RISIS-OrgReg ... Register of HEIs and PROs
- SIPER ... Repository of policy evaluations
- VICO ... Database on startups / venture capital

Notes: Dots represent datasets, lines inter-linking between datasets via key identifiers (e.g. organisation id). Size of dots corresponds to the number of links (i.e. direct links to other datasets)

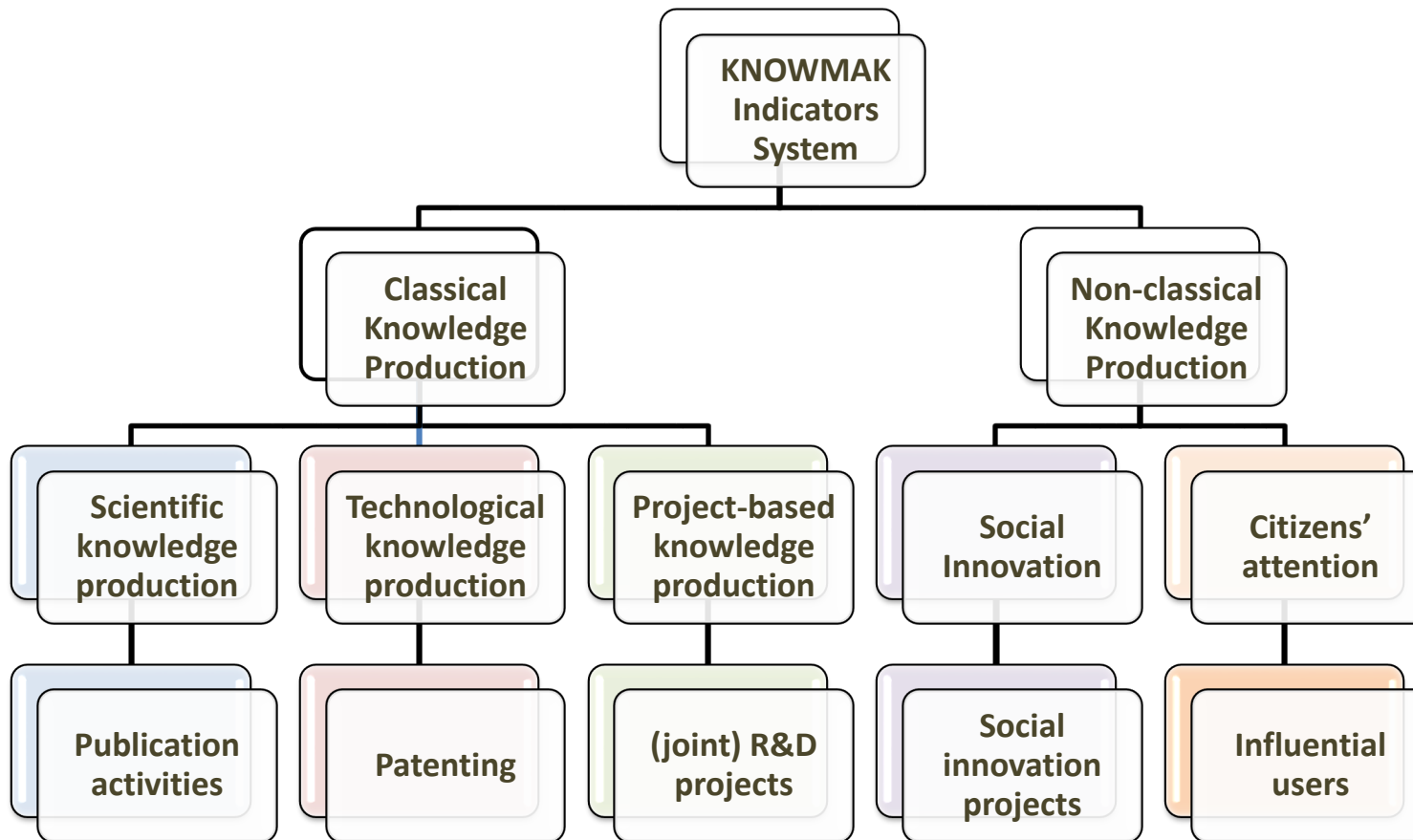
THE RISIS-KNOWMAK data nexus

	<p>CWTS-WoS</p> <p>Enhanced version of Thomson Reuters publication and citation indexes, covering almost 13,000 current international peer reviewed journals and around 15 million publications and all their references</p>	UL
	<p>IFRIS-PATSTAT</p> <p>Global patent data recorded in PATSTAT (patent holders, inventors, technological classification, fine grain patents type selection, etc.), enriched by external data sources and cleaned/standardized information.</p>	UPEM
	<p>EUPRO</p> <p>Systematic information on R&D projects and all participating organizations funded by the European Framework Programmes (EU-FPs). EUPRO covers information on projects and participations (FP1-H2020)</p>	AIT
	<p>ESID</p> <p>Database on social innovation, employing advanced text mining techniques to identify and characterize social innovation projects and actors from known databases and additional sources from the web</p>	Univ. Strathclyde





The overall architecture



KNOWMAK indicators system



Basic indicators implemented so far

Category	Indicator
	<p>Number of publications</p> <p>Number of publications in the Top10% cited</p> <p>Number of intercontinental scientific collaborations</p> <p>Number of Open Access publications</p> <p>Number of tweeted publications (user attention)</p>
	<p>Number of patent applications</p> <p>Number of transnational patent applications</p>
	<p>Number of EU-FP participations</p> <p>Number of EU-FP coordination</p>
	<p>Lists of social innovation projects per spatial entity and topic, with information on project title, website and actors (available via factsheets, see Section 4.3)</p>

Different versions of indicators

- **Raw values:** Raw counts of knowledge production outputs for a given aggregation level
- **Normalisations (population):** Indicators can be derived in normalized to account for size differences
- **Composite indicators:** aggregates selected indicators to one composite indicator

Composite indicators: Composite knowledge production



Knowledge production share

Average of the shares of projects, publications and patents; gives an overall impression of knowledge production activities, in particular when comparing a larger set of regions/countries or whole Europe

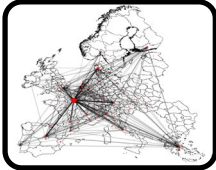


Knowledge production intensity

Total production share normalised by population

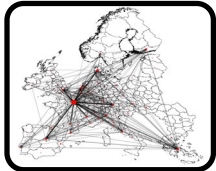
Network based indicators: ERA Network Centrality

The KNOWMAK tool provides network-based indicators, derived from a network where nodes represent regions or countries, and edges different types of knowledge interaction between them:



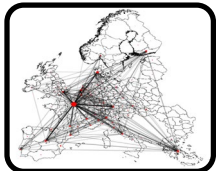
Publication degree centrality

Regional/Country degree centrality in publication networks (number of **cross-regional / cross-country** co-publications by topic)



Patent degree centrality

Regional/Country degree centrality in patent networks (number of **cross-regional / cross-country** co-inventions by topic)



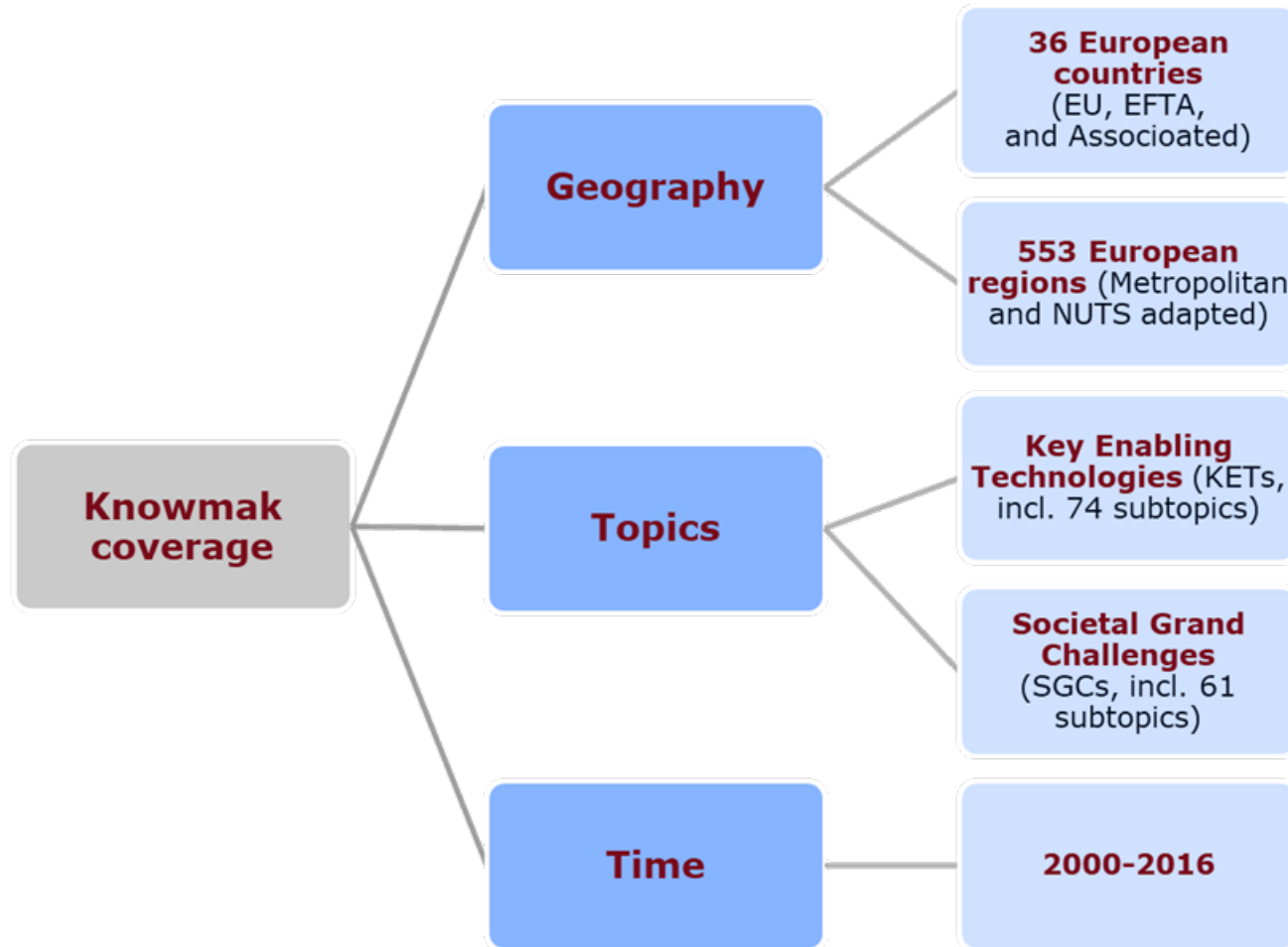
Project degree centrality

Regional/Country degree centrality in project networks (number of **cross-regional / cross-country** FP participations by topic)

Indicators updates and extensions

- List of most active public research **actors** active (for each spatial entity and topic)
- Updated and more robust versions of the ontology until the final release
- Full time series (2000-2016)

KNOWMAK coverage



Accessibility of raw data via RISIS

- Source datasets mobilized in KNOWMAK to publicly provide read-to-use indicators
- However, for deeper analysis the richness of the underlying data sources can be accessed via RISIS [for research purposes](https://risis2.eu) (risis2.eu)
- Submission of research projects via the RISIS datasets portal (rcf.risis2.eu/datasets), enabling distant or physical access to raw KNOWMAK data, among others

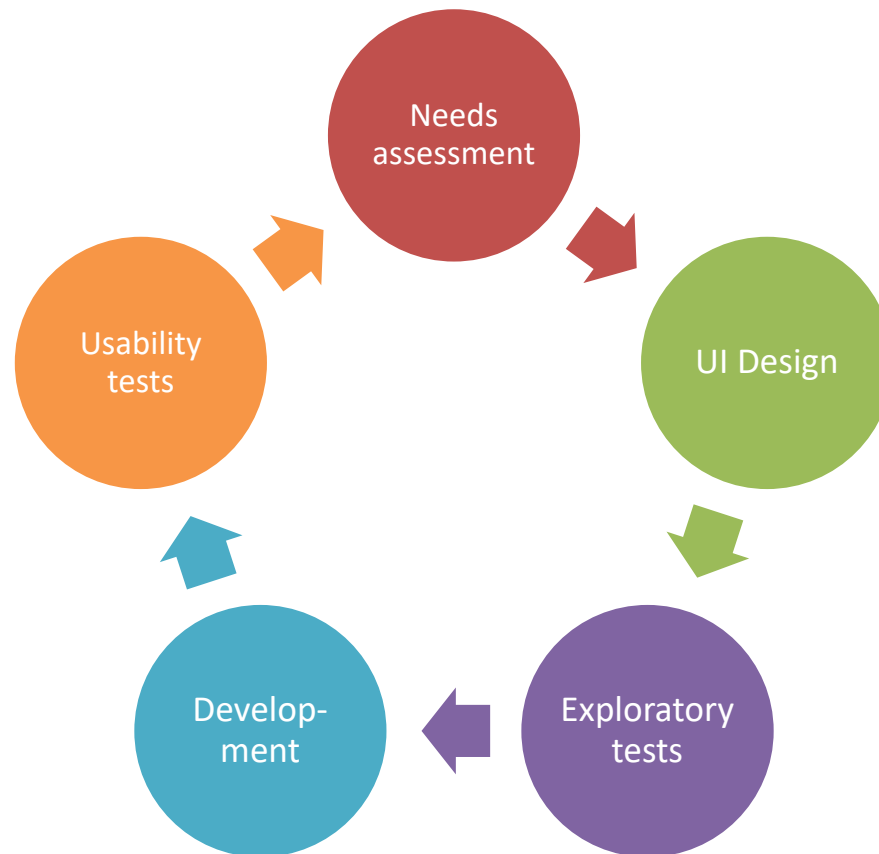
2) KNOWMAK – the tool

Development of the KNOWMAK Tool based on *co-creation* and *openness*

- Participatory approach
- Involving *Lead Users* from the beginning
- Bottom-up, starting with a *needs assessment*

KNOWMAK – User engagement approach

Participatory process



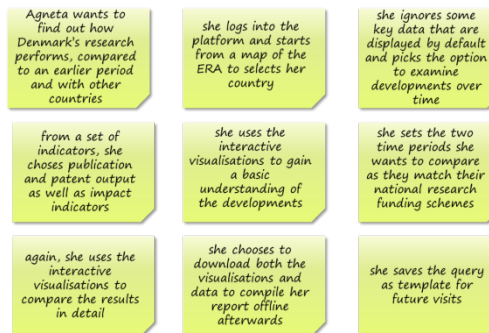
KNOWMAK – User engagement approach

Creative process

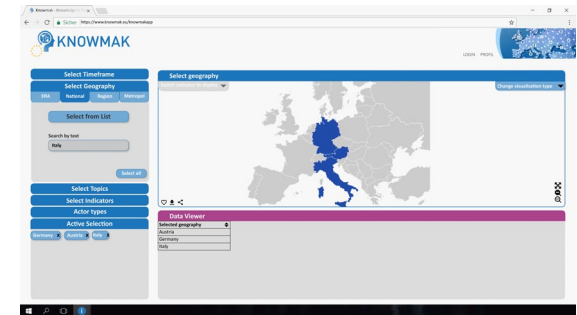
Personas



Usage scenarios



UI design mock-ups



KNOWMAK – USPs

USPs

- Several vital data sources on 1 platform
- Free, open access
- Bottom-up development
- Interactive visualisations
- Regional data available

KNOWMAK – the tool

Exploration via scenarios

- Based on user needs
- From simple to more complex
- Using ...
 - different indicators
 - different geographical levels
 - Individual topics

KNOWMAK – the tool

Scenarios to explore

1. AT publication output in 2016?
2. Strongest patent output in DE regions in 2013?
3. Most publications in Bio-economy in AT regions?
4. Compare AT, CH, DK: normalised publication and patent output?
5. Compare the same countries but use
 - a) knowledge production share
 - b) knowledge production intensity
6. Which is the most highly cited SGC topic, considering all countries?
7. Which are the top 5 public organisations in *climate change* in AT, in terms of EU project participations?
8. Which social innovation projects are there in AT in the same topic?
9. Download the Open Access publications for all countries from 2010 to 2016 – how do they develop over time?

KNOWMAK – the tool

Interactive session



switch to web browser



KNOWMAK

Knowledge in the Making
in the European Society



Danke fürs Interesse :)
=> Diskussions- u. Fragerunde

Mehr Info unter
<https://knowmak.eu>

oder bei Thomas Scherngell und Dietmar Lampert



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