Modelling and Mapping the Dynamics and Transfer of Knowledge. A Co-Creation Indicators Factory Design

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Workshop: Semantic Analysis for Innovation Policy

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The set up

- This project is a development of the **KIMAR** project (*Establishing a Knowledge Infrastructure for the Development of Methodologies for the Assessment of Research and its Impacts*) on which it is based.

- *It has the ambition to create new kinds of multi-dimensional indicators correcting some of the problems related to excessive reliance on one-dimensional criteria, as is often the case, e.g. for rankings. The expected results include a better identification of knowledge-production (and co-creation) and knowledge transfer activities.*

- *A relevant theme for evidence-based Innovation Policy.*

Acknowledgment

- The **KIMAR** project (*Establishing a Knowledge Infrastructure for the Development of Methodologies for the Assessment of Research and its Impacts*)

- is supported by **Clarivate Analytics thorugh the KOL Project (2017-2020).**
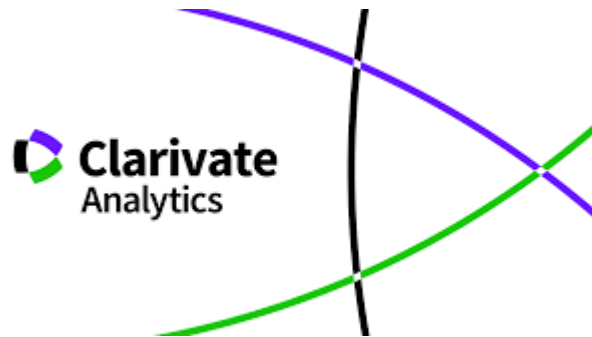
Objectives

Objective: *development of an innovative indicator factory design to develop timely and accurate multidimensional indicators of knowledge co-production, co-creation and transfer*.

It requires the development of a conceptual and empirical framework for the generation of robust models of indicators of knowledge co-production, co-evolution, and transfer over time.

The specific objectives of the project are:

i) the design of a general Co-Creation Indicators Factory (all the actors involved in the interaction between knowledge and society)

ii) the *integration and consolidation* of large and heterogeneous sets of micro-level data with meso and macrodata;

iii) the development of a sound visual analytic approach

iv) the development of new methodologies to estimate 'socially robust' impact indicators;

v) propose a use case on Regional Smart Specialization.

State of the Art

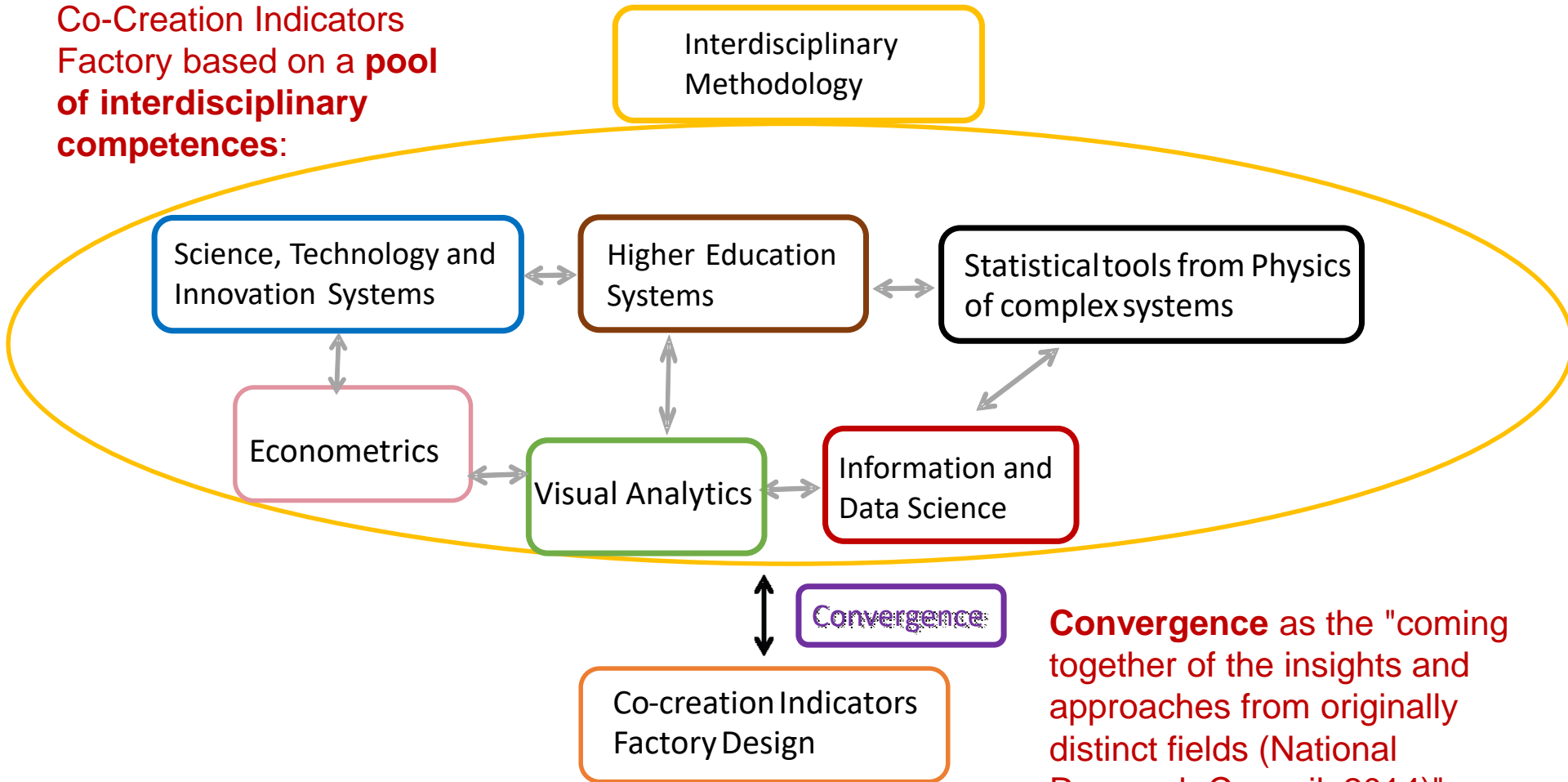- The exponential increase in the availability of data and the impressive developments of tools for data mining and intelligence create huge opportunities to deliver the promise of the information society.

- **Citizens** are much more and better informed than before, due to the *data revolution*, and share their experiences in digital communities.

- They increasingly ask to be involved in decisions.

- Innovation becomes a joint product between *research, digitalisation, and social creativity.*

- This trend creates a challenge to the **old** model of *Science Technology and Innovation (STI) indicator construction and use*.

State of the Art

- The three main actors of the Triple helix (*government, academia and industry*) shared a similar approach to indicators and to their use in decision making.

- The fourth actor in the helix follows a somewhat different logic. Citizens *mobilize around specific issues*. These issues often *cut across traditional boundaries*: they call for multidisciplinary knowledge, involve public-private interaction, need radically new business models and/or public governance models.

- The established factory that produces STI indicators is not adequate here. The required indicators are often new, must be created *ex-novo* in order to illuminate complex issues.

- They cut across existing domains of indicator production.
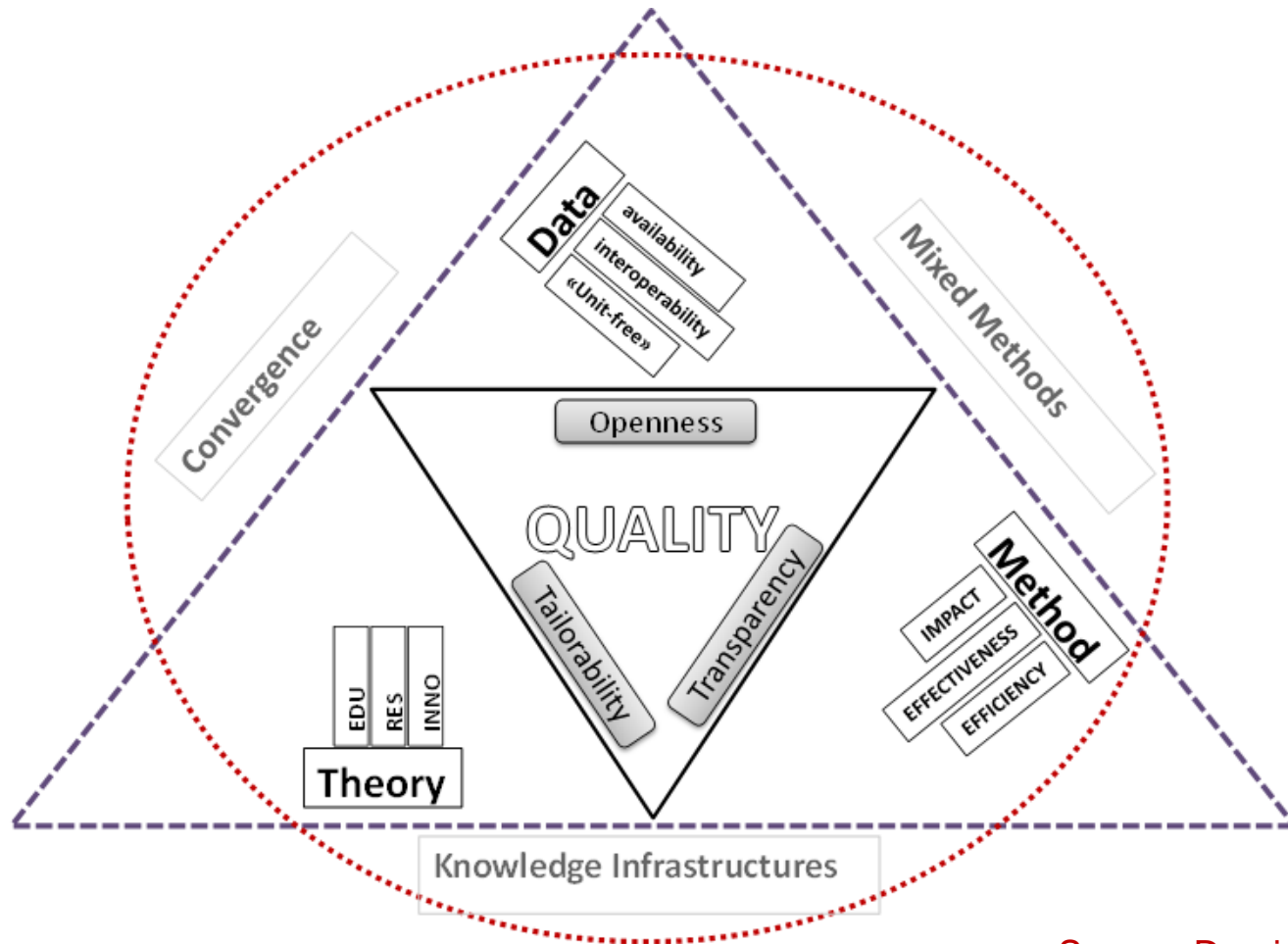
- They must be designed and produced interactively.

Exploiting the Knowledge Infrastructure KIMAR

Co-Creation Indicators Factory based on a **pool of interdisciplinary competences**:

Interdisciplinary Methodology

Science, Technology and Innovation Systems

Higher Education Systems

Statistical tools from Physics of complex systems

Econometrics

Visual Analytics

Information and Data Science

Convergence

Co-creation Indicators Factory Design

Convergence as the "coming together of the insights and approaches from originally distinct fields (National Research Council, 2014)"... power of thinking beyond usual paradigms.
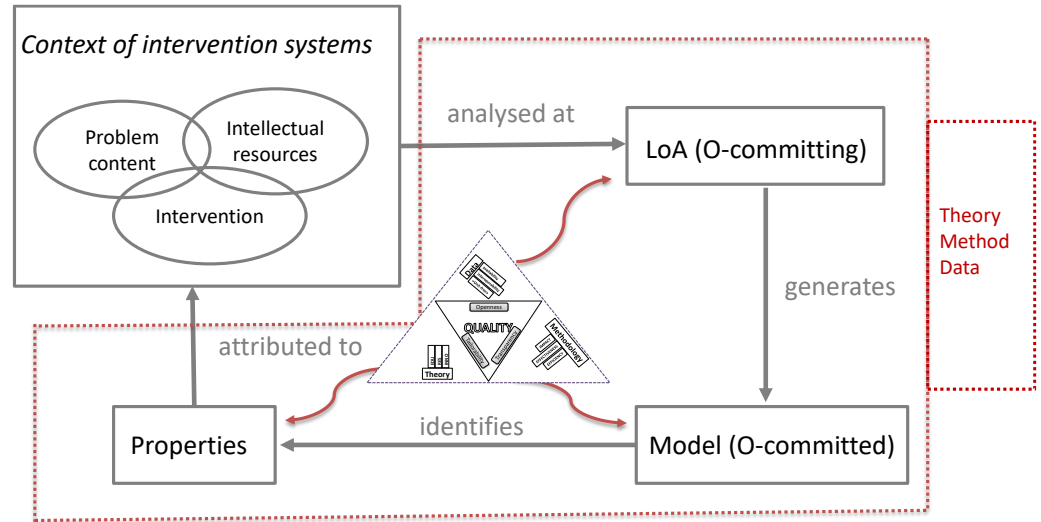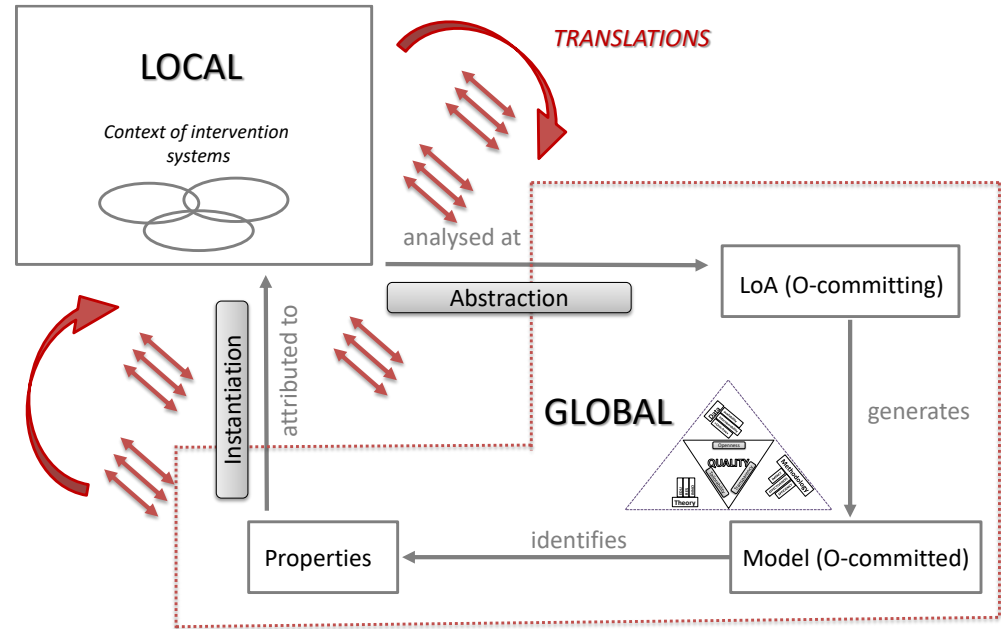
Need for a framework for modelling

Source: Daraio (2017a).

The implementation problem

Panel A

Context of intervention systems

Problem content · Intellectual resources · Intervention

analysed at → LoA (O-committing)

Theory Method Data

generates

attributed to

identifies

Properties ← Model (O-committed)

Panel B

LOCAL

Context of intervention systems

TRANSLATIONS

analysed at

Abstraction

Instantiation

attributed to

GLOBAL

generates

LoA (O-committing)

identifies

Properties ← Model (O-committed)

The use case: A Conditional Efficiency and Visual Analytics Approach to Regional Smart Specialization

Conditional efficiency models are useful to compare the multidimensional innovative performance of regions. They allow to disentangle the impact of regional policy measures into impact on the *competitive* performance of the regions (impact on the *frontier of the best practice*) and impact on the *catching up* (impact on the distribution of the efficiency scores) of less performing regions.

This work proposes to use this approach to model the regional smart specialization, allowing the exploration of its results and underlying data through Visual Analytics, "the science of analytical reasoning facilitated by interactive visual interfaces".

This combination offers the opportunity to develop an open platform to analyze regional smart specialization, improving situational awareness, allowing simulation-based *what-if* scenarios to predict future evolution and/or validate policy alternatives.

Our proposal is useful for policy-makers for the assessment of the policy of cohesion at territorial level (balancing competition with cooperation), scholars interested in regional development, cohesion policy, efficiency analysis and general public (transparency).

- Work in progress: it will be presented at ASTON DEA Conference, Birmingham April 2018 and NAPW 2018 Miami, June 2018.

Conclusions

- Semantic Analysis for Innovation Policy requires the development of models

- Models are required to assess the *robustness* of the choice done

- A framework is necessary to develop models (identify what *is included* and what is *excluded*)

- Modelling is crucial but a delicate art!

- An iterative Top-down - Bottom up modelling approach (from the general to the specific and back!) may be an interesting solution to explore.

- The use case on Regional Smart Specialization can provide an example!

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