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Meaningful metrics

Indicator Frameworks for Fostering Open Knowledge Practices in Science and Scholarship

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Key considerations

- Open knowledge practices are the key issue (not open artefacts or outputs)
- Open science is very diverse
- Generic “OS indicators” are fundamentally in contradiction to the very concept of open science
- Open science is very dynamic: tools come and go
- Indicators are only useful if put in the right context and closely connected to the practices
- Existing/developing metrics are partial and only relevant in a specific context

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Key concepts

- Stimulate the bottom-up development of next generation metrics in the context of the practices that they are meant to indicate
- *Indicator frameworks* guide the development and use of indicators
- *Tool libraries / kits / boxes* that are developed bottom-up need to be harvested and made available
- Different goals – different indicators:

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Indicator frameworks

- goal of evaluation
  - Monitoring
  - Learning
  - Resource allocation
- levels of analysis and use
- research mission
- disciplinary structures and routines
- types of stakeholders and audiences
- research environment
- structural inequalities

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Recommendations: 1

Funding agencies, research performing organizations, publishers, and policy makers work together to prioritize **a four-fold approach to open science**:

- **creating novel infrastructures** to enable effective and efficient knowledge sharing at all points of the research cycle.
- **building open knowledge practice capabilities** in all scholarly communities.
- **investing in best practices and exemplary initiatives** in knowledge sharing which are transformative in their field.
- **including these open knowledge practices in the reward and incentive systems** at national and European levels and removing performance indicators that act as barriers to engagement.

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Toolbox 1: Infrastructure indicators

- enable the monitoring at the system level of progress in developing infrastructures for open science.
- a contextualized suite of **qualitative and quantitative indicators for the development of open knowledge infrastructures**
- oriented to the scientific system at national, international and field levels.

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Toolbox 2: Indicators of open knowledge capabilities in research communities

- understand the extent to which scientific communities have the necessary skills
- a suite of **quantitative and qualitative indicators that monitor the levels of open knowledge capabilities** in the scientific and scholarly communities (including professional support personnel)
- enable the identification of resource availability in specific communities
- focuses on the interaction of scholarly communities with infrastructures

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Toolbox 3: Indicators of pioneering open knowledge practices

- aims to make scientists and scholars more familiar with inspiring examples of novel open knowledge practices.
- a suite of mainly **qualitative, case-study based indicators, maintained on a public platform, that give a state-of-the-art overview of pioneering open knowledge practices**
- may become part of the relevant evaluations (such as national assessment protocols)
- may be maintained by a collective investment in the form of an annual fee by funders, publishers, and research organizations

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Toolbox 4: Individual level indicators for careers

- a suite of **career-oriented qualitative and quantitative indicators**
- support human resource management and evaluation at the level of the individual researcher
- compliant with the requirements of responsible metrics
- two different career paths can be distinguished
  - the development of specialized "open scientist" careers whose main role is the development and maintenance of novel open science infrastructures;
  - the integration of open knowledge practices in mainstream scientific and scholarly careers. In the latter case, the integration of open knowledge criteria with existing career criteria is crucial.
- build on the existing designs of the ACUMEN portfolio and the Career Evaluation Matrix proposed by the OSPP
- prioritize phasing out of output indicators that make it more difficult for researchers to engage in open knowledge practices

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FAIR meta data

- All indicator toolboxes should be based on FAIR data
- the algorithms should be open source,
- Non-transparent indicators should be excluded from the indicator frameworks
- Citation indicators should also be based on the FAIR Data principles
- Indicators should be user-driven and defined by the community.

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Mode of use of indicator frameworks

These indicator toolboxes will be used to populate indicator frameworks that can be applied in two fundamental modes:

- a learning mode (most applicable to stimulate researchers' engagement with open knowledge practices) and
- an accountability mode (most applicable to monitor the development of new policies and infrastructures as well as changing practices of funders and publishers).

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Steering groups

- Funders and research performing organizations should collaborate in open knowledge steering groups
- advise on the development and subsequent application of the appropriate indicator frameworks and toolboxes.
- ensure that the indicator frameworks will be based on the needs of researchers to develop open knowledge practices and not on the arbitrary availability of ready-made indicators or data
- prevent re-inventing the wheel again by different scientific and scholarly communities

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Open Science Observatory

- an annual review of the state of the art of open science in the form of an annual Open Science Observatory based on all available descriptive statistics, the four toolboxes as well as in-depth case studies
- develop case studies of the indicator frameworks and also provide examples of how the toolboxes are used in specific contexts. Information about the national science platforms can also be brought together in the observatory.

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Support consortia

- We recommend that the European Commission publish a call for proposals to support consortia of research performing organizations to develop open science capabilities to develop their own indicator frameworks and select appropriate indicators from the toolboxes in accordance to these frameworks, based on the principles of responsible metrics.

ACUMEN portfolio

aim is to give researchers a voice in evaluation

- evidence based arguments
- shift to dialog orientation
- selection of indicators
- narrative component
- Good Evaluation Practices
- envisioned as web service

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ACUMEN Portfolio

Career Narrative

Links expertise, output, and influence together in an evidence-based argument; included content is negotiated with evaluator and tailored to the particular evaluation

Expertise

- scientific/scholarly
- technological
- communication
- organizational
- knowledge transfer
- educational

Output

- publications
- public media
- teaching
- web/social media
- data sets
- software/tools
- infrastructure
- grant proposals

Influence

- on science
- on society
- on economy
- on teaching

Evaluation Guidelines

- aimed at both researchers and evaluators
- development of evidence based arguments (what counts as evidence?)
- expanded list of research output
- establishing provenance
- taxonomy of indicators: bibliometric, webometric, altmetric
- guidance on use of indicators
- contextual considerations, such as: stage of career, discipline, and country of residence

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