European Network for FAIR Academic Metrics – ENFAIRAM COST Action proposal 2021

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Abstract

The open science paradigm, digitalisation, interdisciplinarity, and internationalisation have significantly changed the research process, collaboration, dissemination, and impact of scholarly work in the 21st century. Research impact assessment should include new metrics based on Web 2.0 channels suffering from the following issues: data quality (i.e., accuracy, coverage, comprehensiveness), heterogeneity of data sources and APIs, and potential manipulation (i.e., metrics gaming). Although the Findable, Accessible, Interoperable, and Reusable (FAIR) principles were designed for research data, they can also be applied to research impact metrics to increase their discoverability and reusability. The main aim of this European Cooperation in Science and Technology (COST) Action is to remove barriers for the wider adoption and reusability of metrics based on Web 2.0 technologies, which are a significant and vital part of research ecosystems. These metrics can serve as the basis for enhanced research impact assessment and, thus, improve recognition of excellence and foster the further development of science and society. Although Scientometrics based on Web 2.0 is a paradigm that is over 10 years old, it has not yet been widely adopted. Therefore, a plan or roadmap for transition to Scientometrics 2.0 is needed. This should include recommendations for overcoming the challenges associated with new research impact

metrics, as well as frameworks for the evaluation of new metrics and data sources. These challenges include the heterogeneity and comprehensiveness of metrics data sources, the varying quality of metrics data, metrics data gaming, etc. Due to the multifaceted nature of these challenges, the Action proposes to create synergies between all interested actors: researchers, research software engineers, librarians, representatives of metrics data providers, and policymakers.

This article presents an edited version of the original funding proposal submitted to the COST Open Call 2021.

Keywords

research impact metrics, Web 2.0, standardization of communication and data representation, data quality, FAIR

1 S&T EXCELLENCE

1.1 SOUNDNESS OF THE CHALLENGE

1.1.1 DESCRIPTION OF THE STATE-OF-THE-ART

The open science paradigm, digitalisation, interdisciplinarity, and internationalisation have all significantly changed the research process, collaboration, dissemination, and impact of scholarly work in the 21st century. Science is not only publication-based anymore. A variety of new types of research output have emerged in recent decades: datasets, software, workflows, and specific article types such as data papers, reproducibility papers, code papers, executable papers, etc. Despite the recognition that open science involves a wide range of practices and considerations such as open data, open reviews, open workflows, and open education (Guy and Ploeger 2015), many policies focus on regulating and encouraging open access to publications alone (The PASTEUR4OA consortium 2016, Leonelli et al. 2015). ROARMAP is an international, searchable registry with more than 1,000 catalogued open access mandates and policies, primarily related to open access publications. With a few notable exceptions, rewarding other open science practices is still in the recommendation stage, rather than the implementation stage. For instance, the Open Science Career Assessment Matrix (OS-CAM), which recognizes the diversity of open science outputs and practices, has yet to be implemented. Moreover, communication with society has changed and the involvement of citizens in team science, as well as the interdisciplinarity of research teams, are encouraged. This a topic has already been discussed in the community at various workshops, such as the two-day “Digital Transformation in Scholarly Communication” workshop organized by Science Europe in November 2019. There is a demand to demonstrate the impact of research beyond academia, and to democratise this impact by giving greater voice and vote to underrepresented groups

(gender, ethnicity, disability, geographic, etc.) in determining it (Memisevic et al. 2017, Sugimoto 2016).

Therefore, communication and dissemination channels have changed, and citations of textual publications are no longer the only measure of impact. New metrics, which may include Web 2.0 channels, can inform research impact assessment (Cronin et al. 1998). Open science, social media metrics, and alternative metrics represent the groundwork and components for the new concept – Scientometrics 2.0. In 2001, Cronin presciently predicted that as a more diverse publishing environment emerges, bibliometricians will have a much broader array of objects and artifacts to feed their accounts and analyses (Cronin 2001). Scientometrics 2.0 embraces the move to new platforms for scholarly practice as a source for this "broader array," and presents an exciting opportunity to improve our image of scholarship.

However, the majority of metrics are still citation-based, which is a slow process (due to the time required for articles to accumulate citations) and a biased one (as larger fields tend to accumulate more citations than specialized ones, regardless of quality). Therefore, this narrow focus is not suited to the increasingly fast and broad Web 2.0-based scholarly world. While using citations for other types of research output, such as to data and software, is increasingly encouraged, the infrastructure and standards for this approach are not yet well developed. The Next Generation Metrics report (Wilsdon et al. 2017) recommends using citations for all research outputs and highlights that the academic assessment indicators can only reach their full potential if they are underpinned by an open and interoperable academic data infrastructure based on persistent identifiers (PIDs). Lowenberg et al. (2019) proposed a vision for the development of open metrics, i.e. metrics that are open, and can be used, shared and built upon freely by anyone. This vision also includes recommendations for metrics to be inclusive (i.e., applicable to all disciplines, and to consider all data types), transparent, and multi-dimensional (e.g., by not conflating multiple dimensions into a single number). The Snowball Metrics initiative (Clements et al. 2017) similarly calls for more open metrics, where calculations and recipes are made publicly available. The Make Data Count project (Cousijn et al. 2019) addresses the significant social as well as technical barriers to the widespread development of data metrics.

In recognition of the fact that non-publication research outputs (e.g., data, software and other outputs) are not literature, and that citations may not adequately capture the range of uses for these outputs, alternative metrics (altmetrics), such as social network activities, views, downloads, etc. are being investigated as a way to demonstrate the attention received by a range of outputs and audiences (Fecher and Friesike 2013). Similar to citation databases, there are different data sources, ranging from individual repositories to aggregators, which can define and use numerous metrics for research outputs. The authors of "Open Data Metrics: Lighting the Fire" (Lowenberg et al. 2019) suggest differentiating data usage at different levels, e.g., different levels of views (of metadata, images, etc.) and downloads (file or dataset level). They warn that without standardisation of counting views and downloads, any definition of these used by various stakeholders can be arbitrary. While counts are not metrics per se, they can

be standardised in order to create a metric. The COUNTER Code for Research Data is a promising way to standardise data usage counts, but at the moment there are many different ways of counting, which are being implemented. Although there are calls for individual repositories to report their usage metrics to centralised data brokers, such as DataCite, this rarely occurs (Konkiel 2020). Transforming these counts into a measure of data reuse is a thorny issue and raises many questions: What type of use? Scholarly? Societal? By whom and for which purposes? Are there different levels of views (of metadata, images, etc.) and downloads (file or dataset level)? Standardization of counting views and downloads is needed.

Social media activity can be used to measure attention by using indicators such as shares, likes, tweets, comments and downloads (Sugimoto 2016). Altmetrics aggregators, such as PlumX and Altmetric, collect diverse alternative metrics from various sources. Alternative metrics offer many potential benefits for assessing new research formats and outputs, as well as new types of usage. Altmetrics can assess interdisciplinary research and the impact of scientific results on the society as a whole, because they can include the views of all citizens, not just other scholars (Wilsdon et al. 2017, Ravenscroft et al. 2017).

Although social media metrics and other altmetrics (e.g., tweets and downloads) offer an alternative to publication-based metrics, they are rarely incorporated into assessments of researchers and the science of science. This may be due to known challenges, such as data quality (e.g., accuracy, coverage, comprehensiveness), the heterogeneity of data sources and application programming interfaces (APIs), and potential manipulation (e.g., metrics gaming). Altmetrics are mostly tied to provider platforms and their regulations (e.g., X/Twitter's rules for data sharing); the quality of the underlying data; and their potential to be manipulated by bots. There is also a lack of consistency and accuracy, among others (Haustein 2016). Data collected by altmetrics aggregators are also biased towards the parent companies' data sources (e.g., Altmetric towards Digital Science / Dimensions, and PlumX towards Elsevier). Unfortunately, aggregators do not have meaningful disciplinary benchmarks at the moment (Konkiel 2020). Fenner (2013) identifies some additional questions that need to be addressed before altmetrics can be used for assessment, such as whether altmetrics can be applied across disciplines and over time to measure research; what they measure (e.g., impact or popularity); and whether their application in assessment can produce undesired incentives. Furthermore, some analysts argue that major social academic networking sites have not yet proven their essential worth (Van Noorden 2014), and that they should not "count toward scholarly reputation" (Jamali et al. 2015).

Responsible research assessment guidelines (e.g., the San Francisco Declaration on Research Assessment, the Leiden Manifesto for research metrics, the Hong Kong Principles for assessing researchers) (Cagan 2013, Hicks et al. 2015, Moher et al. 2020) converge on the themes of diversity of research activities and outputs, transparency of systems and indicators, and reflexivity about indicators and practices. They also highlight the need for robust, comparable data, and open and Findable, Accessible, Interoperable, and Reusable (FAIR) assessment infrastructure, which can be used to calculate metrics

to use in informing (and not completely driving) a variety of assessments. Moreover, these topics are discussed at some conferences, forums and in projects by bibliometricians: https://lisbconference.wordpress.com/, https://bric-conference.ca/, https://www.nihlibrary.nih.gov/services/bibliometrics/bibSymp20/agenda, https://blog.tib.eu/2020/06/02/a-public-archive-for-the-videos-of-the-altmetrics-conferences-and-workshops/, https://thebibliomagician.wordpress.com/, https://www.uantwerpen.be/en/conferences/30th-annual-international-conference-on-science-and-technology-indicators/, and https://avointiede.fi/en/networks/eosc-co-creation.

1.1.2 DESCRIPTION OF THE CHALLENGE (MAIN AIM)

To better assess the impact of research, Scientometrics 2.0 should take into account new publication and communication channels. This should include numerous ways of promoting science, channels that promote citizen science (i.e., the inclusion of citizens in research), and the open science paradigm. The development and adoption of the Scientometrics 2.0 paradigm is not currently at the same level as the development and adoption of Web 2.0. Scientometrics 2.0 introduces many more sources. This is why standardization of communication, APIs, quality levels, descriptions, and formats for representing metrics is necessary. Databases and resources based on linked research ecosystem entities are needed, as well as new metrics that measure the impact of research within the scholarly community and its impact and popularity within society.

On the one hand:

- The research community (i.e., researchers, organizations, research software developers) has invested considerable effort in supporting the open science paradigm, team science (including citizen science) and communication with citizens. There are infrastructures in place to support these new trends, as well as many researchers and organisations that practice and support them at an organizational level;
- Policy and decision-makers (i.e., at local, national, and EU levels) have invested some effort in supporting this cultural change by promoting the re-use of data and other research outputs, and by promoting communication and collaboration with citizens
- Citizens are also recognizing the opportunity to participate in the research process or simply be informed about its results. This means that more and more citizens are participating in crowdsourcing (citizen science) projects, following research news on blogs and social networks, or downloading research results.

On the other hand:

- The reliable and popular metrics used for the science of science, to measure the impact of research, and to recognize trends in science have not been adopted to the previously described cultural changes, and can therefore lead to wrong conclusions

- Even worse, these metrics can produce undesired incentives, meaning that some researchers, organizations and policymakers act in a way that is not in the best interests of research quality, but instead in accordance with the popular metrics currently in use.

In addition to the numerous academic and research impact metrics defined by scientometricians and published in research articles, or by local policymakers or data providers, some of these metrics are not visible to the community. Although the FAIR principles were designed for research data, they can be applied to other research ecosystem entities, including academic metrics to increase their discoverability and reusability. The main aim of this COST Action was to remove barriers to the wider adoption and reusability of metrics based on Web 2.0 technologies, i.e., to address some of the key challenges of Scientometrics 2.0. The motivation behind removing these barriers, i.e., the main aim of the Action, is to recognize metrics for the impact of research based on Web 2.0 as a significant and vital part of research ecosystems, which can enable a better assessment of the impact of research and, thus, enhance the recognition of excellence and foster the further development of science and society. Although Scientometrics 2.0 is a paradigm that is over 10 years old, it is still not widely adopted or used. Therefore, a plan or roadmap for the transition to Scientometrics 2.0 is needed. This should include recommendations for dealing with the challenges of new academic metrics and benchmarks for evaluating new metrics and data sources. These challenges include the heterogeneity and comprehensiveness of metrics data sources, the different quality of metrics data, and metrics data gaming.

1.2 PROGRESS BEYOND THE STATE-OF-THE-ART

1.2.1 APPROACH TO THE CHALLENGE AND PROGRESS BEYOND THE STATE-OF-THE-ART

To get a comprehensive picture of the state of development and uptake of Scientometrics 2.0, as well as the challenges to its application and wider adoption, the expertise of the COST Action members from different backgrounds will be used to create a directory of relevant resources and to design a survey, disseminate it and analyse the resulting data. Additionally, a review of the state-of-the-art will be conducted and a roadmap will be created to overcome the challenges of implementing Scientometrics 2.0. The roadmap will include a vision for the scholarly community and a set of recommendations to achieve it. The Action participants will study certain technologies and software ecosystems around them. Besides strengths and perspectives of technologies and software systems, their limitations should be analyzed as well. The plan will strike a balance between feasibility and usefulness. This means that all the challenges of Scientometrics 2.0, such as the heterogeneity of data sources and data reliability (i.e., data quality and gaming) will be analyzed in depth, and realistic solutions for overcoming these challenges will be suggested. Similarly, any suggested solutions must not undermine the main benefits of using Web 2.0 to study the impact of research and must take into account the specific characteristics of various scientific disciplines. These characteristics include how certain

scientific fields generate knowledge, what kind of scientific and societal interactions characterise these fields, and what are the patterns of dissemination in these fields. Therefore, the Action will adopt an innovative approach to address these challenges by combining the following four perspectives:

1. **A technology-driven perspective**
    - by analysing what the technology and the current research in the area can contribute
2. **A domain-driven perspective**
    - by analysing the specific practices and scientific activities of the Action participants with different scientific backgrounds
3. **A region-driven perspective**
    - by analysing the specific practices and scientific activities of the Action participants coming from various parts of Europe, and
    - by examining the need and possibility for aligning policies across Europe to increase its global competitiveness.
4. **A purpose-driven perspective**
    - by analysing general cultural changes in science, in publishing research outputs and communication over the last decade, and
    - by analysing the different purposes for which academic metrics are used, such as:
        - individual and group academic assessment, the science of science (trends, patterns, etc.), and the study of correlation between policies and scientific results

To address the identified challenges, the Action developed its strategy based on the following three fundamental pillars:

1. **Standardization:**
    - studying techniques and novel methods for the standardization of formats, APIs and query languages to facilitate the use of metrics data sources and the application of artificial intelligence techniques
    - studying machine-actionable language notations for expressing metrics
2. **Quality of academic metrics data sources:**
    - studying techniques for representing data quality and provenance, and for making verifiable claims
    - studying techniques for detecting metrics gaming
    - assessing comprehensiveness of metrics data sources
3. **FAIRness of academic metrics:**
    - building a register of available metrics data sources and academic metrics
    - adapting the FAIR principles for the description of metrics

Addressing the challenges requires a complete solution that exploits synergies between several disciplines. This is typically not achievable within funding frameworks other than COST, due to the specific focus and numerous areas of expertise usually required of applications. To maximize knowledge sharing among participants and the

establishment of lasting professional relationships, brainstorming, networking sessions, and team-building activities will be organized. Meetings will be organized, where participants will be grouped together and asked to produce a 'tangible' outcome of their work or to discuss a topic in a short amount of time. These efforts are necessary for the rapid development of business applications that bridge the gap between the requirements for the application of Scientometrics 2.0 and the available software solutions.

1.2.2 OBJECTIVES

1.2.2.1 RESEARCH COORDINATION OBJECTIVES

The Action is built around three main pillars, each represented by a working group (WG). These WGs define the following seven research coordination objectives (RCOs):

Standardization

RCO 1. Listing of the possible usage of metrics data sources, the definition of the needed high-level functionalities, and the definition of API endpoints that metrics data sources should offer, including the input and output data formats for these endpoints (in accordance with the General Data Protection Regulation, or GDPR), and query language notation.

RCO 2. The specification of a vision for the architecture of a global research ecosystem, defining its main e-infrastructure elements in terms of their functionalities, inputs, and outputs, with a particular focus on the linking of e-infrastructure elements' data including its connection with metrics data sources.

RCO 3. The specification of machine-actionable language notations for expressing metrics (i.e., the AcaMet domain-specific language). This notation will enable the automatic calculation of numeric metrics based on persistent identifiers and metrics data sources.

Quality of metrics data sources

RCO 4. The development of frameworks with criteria for evaluating the data quality of the metrics data source (e.g., provenance tracking, the status of the data verification process, and verifiable claims), as well as for assessing the coverage and comprehensiveness of these sources.

RCO 5. The specification of recommendations for detecting and dealing with academic metrics gaming.

FAIRness of academic metrics

RCO 6. The development of a web register for metrics data sources and metrics. The register will utilize FAIR and open review principles, meaning that data sources and

metrics will be represented in accordance with the FAIR principles and open discussion about the pros and cons of the sources and metrics will be permitted.

RCO 7. Filling in the web register with information about existing metrics data sources and metrics. A thorough description of the metrics in the register will prevent new metrics and quantitative indicators from being overlooked, misapplied, or misinterpreted. Moreover, open discussion will facilitate the exchange of best practices within the community for developing metrics and selecting their data sources. Furthermore, open discussion will facilitate the recognition and anticipation of the systemic and potential effects of certain metrics and prompt their updating in response (i.e., reflexivity).

1.2.2.2 CAPACITY-BUILDING OBJECTIVES

The Action includes the following three capacity-building objectives (CBOs):

CBO 1. Establishing a cooperative, multidisciplinary network of researchers, research software engineers, librarians, policymakers, and metrics data providers to promote the development and the effective use of new metrics based on new Web 2.0 sources. The Action will encourage active and transparent participation of the members through the following instruments:

- A call for volunteers to support the definition and organisation of each event (e.g., meetings and training schools) will be circulated via email.
- Calls for participation in the meetings, for the Short Term Scientific Mission (STSM) applications, and for the ITC conference grants will be circulated regularly via the Action mailing list.
- Applications for the Short Term Scientific Missions will be assessed based on the following criteria: collaboration between Early Career Investigators (ECIs) and senior researchers; collaboration between participants with different various backgrounds and regions. These criteria will be defined and published at the beginning of the Action.

CBO 2. Building a critical mass of community and published results to ensure the sustainability of the research themes beyond the Action:

- An open annotated bibliography will be created. This will contain a collection of slides, tutorials, and other training materials, scientific papers, datasets, as well as other materials relevant to the research themes.
- The network of academics, researchers as well as other stakeholders will be enlarged during the Action compared to these initially involved in the Action proposal.
- Two open conferences will be organized in Inclusiveness Target Countries (ITCs) during the Action, with brainstorming sessions to enable the establishment of new research collaborations with local researchers and other interested participants, who are not part of the Action. Moreover, these events could contribute to further enlargement of the official list of the Action members.
- Submission of joint international project proposals will be encouraged.

- The web register of metrics data sources and metrics, including open discussion features, will help to build a community beyond the Action as well.

CBO 3. Transferring the knowledge to the wider scientific community and other stakeholders:

- The results of the Action will be disseminated through high-quality conferences and journals.
- The Action website and social networks will be used to communicate with citizens and other interested parties.
- The Action members will participate in and organize events with people from government and commercial data providers promoting the reuse of the Action outcomes in professional applications.
- Three training schools and two open conferences will be organized to disseminate the achievements of the Action.

2 NETWORKING EXCELLENCE

2.1 ADDED VALUE OF NETWORKING in S&T EXCELLENCE

2.1.1 ADDED VALUE IN RELATION TO EXISTING EFFORTS AT EUROPEAN AND/OR INTERNATIONAL LEVEL

The research ideas proposed by this Action have only been partially addressed by other initiatives and research projects. Many initiatives and declarations suggest that approaches to the science of science, and the assessment of scientific results and impact should change in line with cultural shifts among scientists and their activities and outputs.

- The San Francisco Declaration on Research Assessment, known as DORA, facilitates the development of responsible research and researcher assessment policies and practices (Cagan 2013).
- The Leiden Manifesto for research metrics defines best practices in metrics-based research assessment and suggests that efforts for evaluators and applicants should be decreased, which is possible to achieve by developing appropriate e-infrastructure (Hicks et al. 2015).
- The Metric Tide report discusses and elaborates criteria of responsible metrics from the perspective of the UK's Research Excellence Framework (REF) (Thelwall et al. 2015).
- The Hong Kong Principles focus on the need to drive research improvement through ensuring that researchers are explicitly recognised and rewarded for behaviours that strengthen research integrity (Moher et al. 2020).
- The INORMS Research Evaluation Working Group was established to consider how best to ensure that research evaluation is meaningful, responsible, and effective (Gadd et al. 2021).

- FORCE11 is an international coalition of researchers, librarians, publishers, and research funders working to reform or enhance the research publishing and communication system (Martone 2015).
- The COST Action ENRESSH is an example of a European effort to propose best practices in the field of social sciences and humanities (SSH) research evaluation (Kulczycki et al. 2018).
- The Latin American Forum for Research Assessment (FOLEC) is an example of a regional space for debate and exchange on the meanings, policies, and practices of research evaluation (Beigel 2020).

Moreover, there are some more practically oriented solutions related to the Action theme, which are outlined below:

- Scimeter (https://scimeter.org/) allows everyone to create their own metric to capture what they personally consider the best possible way of quantifying scientific impact of arXiv preprints.
- Dimensions (https://www.dimensions.ai/) maps the entire research lifecycle, meaning users can follow research from funding through research output to impact. Users are encouraged to use the broad range of connected data available in the Dimensions database to develop the next generation of useful metrics.
- Digital Science and Elsevier developed Altmetric (https://www.altmetric.com/) and PlumX Analytics (https://plumanalytics.com/) tools for tracking where published research is mentioned online, i.e. for measuring the influence of scientific research outputs. Both tools offer embeddable widgets/badges to display metrics on a website, as well as APIs for fetching all metrics values assigned to a research output.
- The European Research Infrastructure for Science, Technology and Innovation Policy Studies (RISIS) (https://www.risis2.eu/) is a Horizon 2020 project aiming at building data and services infrastructure supporting the development of a new generation of analyses and metrics. The RISIS-KNOWMAK tool, which is a result of this project, enables the analysis and download of a number of relevant integrated metrics on knowledge production in Europe (https://www.risis2.eu/risis-indicators/).

Therefore, the need to change the techniques and metrics used to measure impact of research, due to development of Web 2.0 and the cultural changes among researchers is recognized. Unfortunately, some of the challenges associated with implementing this change have yet to be resolved. Therefore, the theme of the Action is still not yet fully addressed by other European and global projects and initiatives. However, the theme is recognized as an important within the community. Some of the above-mentioned initiatives are goal-oriented without analysing the challenges or the feasibility of the recommendations. Moreover, some of the referenced projects and initiatives are discipline- or country-specific. The Action will analyze the challenges from the following four perspectives: technology-driven, domain-driven, region-driven, and purpose-driven. For all these perspectives, knowledge and expertise in informetrics, information science, computer science and social sciences are necessary, as well as representatives of

different scientific fields and parts of Europe. Moreover, metrics data providers and policymakers could contribute to a better understanding of, and response to, the challenges. There is no 'one size fits all' solution when it comes to measuring the impact of research in different scientific disciplines, parts of Europe, and for different purposes. Therefore, networking is essential for addressing challenges concerning changing techniques and metrics for measuring the impact of research at the European level. The COST Action program is the ideal tool for bringing together the expertise and skills from different scientific fields and European regions, and for engaging in research projects in challenging areas. The Action will facilitate bringing multidisciplinary people together and help establish a common ground for communication, which is pivotal for working on the identified challenges.

2.2 ADDED VALUE OF NETWORKING IN IMPACT

2.2.1 SECURING THE CRITICAL MASS AND EXPERTISE

The achievement of the RCOs and CBOs (see Sections 1.2.2.1 and 1.2.2.2) requires the following knowledge and expertise from several disciplines at the intersection of informetrics, information science, computer science, and social sciences:

- expertise in diversified, but complementary fields, as well as with different research skills, ranging from theoretical to practical, to address the multifaceted nature of the challenges,
- different countries and parts of Europe are considered, taking into account the specificity of scientific practices and activities by different regions and disciplines,
- different goals
    - researchers, who are aiming to start new research projects and identify new challenges,
    - early career researchers with the goal of consolidating their skills,
    - trainers, who want to find new materials and scenarios for their activities,
    - researchers from commercial metrics data providers can collect the feedback on what their infrastructure should offer,
    - research software engineers can identify the gaps and needs for the implementation of new e-infrastructure, and
    - policymakers, who want to learn about the barriers and possibilities of applying metrics based on Web 2.0 in research impact assessment

The network of the Action proposers consists of 27 Members belonging to organizations in 22 Countries. The network includes representatives from the following five stakeholder categories:

- Researchers will bring expertise in theoretical and practical aspects of informetrics, information science, computer science and social sciences.
- Research software engineers will bring expertise in technical and practical aspects of building and maintaining research e-infrastructures, APIs, and GUI.

- Librarians will bring expertise in information science and cataloguing scientific outputs and activities.
- Representatives of the metrics data providers will share their expertise on existing challenges, and how they can be addressed. They will also discuss what is needed to overcome these challenges and when this could be achieved.
- Policymakers will contribute their expertise in group and individual assessment of research outputs and activities. They will also share their experience of creating undesired incentives when metrics are introduced to inform research impact assessments.

The Network already includes a large number of participants, but further activities are planned to involve and reach a critical mass of active experts, which will ensure sustainability of the network beyond the Action (see the Section 1.2.2.2).

2.2.2 INVOLVEMENT OF STAKEHOLDERS

During the Action, synergies among the relevant stakeholders will be sought to include different perspectives and to develop the most comprehensive and effective solutions for overcoming the identified challenges. The relevant stakeholders belong to five stakeholders categories, who will contribute to the Research Coordination Objectives and/or will benefit from them (Section 1.2.2.1):

- Researchers: RCO1, RCO2, RCO3, RCO4, RCO5, RCO6, and RCO7
- Research software engineers: RCO1, RC02, RCO5, and RCO6
- Librarians: RCO1, RCO4, and RCO7
- Representatives of metrics data providers: RCO1, RCO2, RCO3, RCO4, and RCO5
- Policymakers: RCO1, RCO2, RCO4, and RCO7

The network of the Action proposers already includes representatives from all these five groups.

Furthermore, the Action includes the following activities to boost stakeholder involvement:

- The exploitation of the Action Members' network of contacts with potential interested stakeholders will be organized at the kick-off meeting of the Action.
    - formal calls for participation will be issued and sent to public sector organizations that the Action Members have identified as relevant.
- Spreading the word about the Action trough the following activities
    - by using leaflets, Twitter (now X), a newsletter, a mailing list, a website, tutorials, demonstrations, and papers.
    - by organizing events such as open conferences, and training schools to promote the Action results to the attendees and to invite external stakeholders as participants and speakers.

- by participating and presenting in events (e.g., workshops, conferences) organized by the Action members' institutions and other organizations.

2.2.3 MUTUAL BENEFITS OF THE INVOLVEMENT OF SECONDARY PROPOSERS FROM NEAR NEIGHBOUR OR INTERNATIONAL PARTNER COUNTRIES OR INTERNATIONAL ORGANISATIONS

The themes addressed by the Action are global and deal with challenges that are not specific to Europe alone. Therefore, similar challenges exist outside Europe as well, and the results of the Action may be of interest to stakeholders in Near Neighbour Countries (NNCs) and International Partner Countries (IPCs). Similarly, representatives of NNCs and IPCs will share their experience about scientific activities and publications patterns in their regions. These will be taken into account when defining research impact metrics based on Web 2.0, as well as when overcoming the challenges and barriers to applying these metrics. Moreover, NNCs and IPCs can participate in the Action as one of five identified stakeholders groups, thereby contributing new knowledge and expertise to the network. The network proposing the Action includes one member from an NNC and one member from an IPC. Moreover, the Action proposers have strong relationships with researchers affiliated with organizations located in NNCs and IPCs. These connections will be used to increase the number of representatives from NNCs and IPCs further, provided that their participation in the Action would be mutually beneficial and take into account their areas of expertise.

3 IMPACT

3.1 IMPACT TO SCIENCE, SOCIETY AND COMPETITIVENESS, AND POTENTIAL FOR INNOVATION/BREAK-THROUGHS

3.1.1 SCIENTIFIC, TECHNOLOGICAL, AND/OR SOCIOECONOMIC IMPACTS (INCLUDING POTENTIAL INNOVATIONS AND/OR BREAKTHROUGHS)

The Action will contribute to the transparency, reliability, and reusability of metrics. Moreover, it will foster metrics that consider the various Web 2.0 channels used by scholars to communicate with the wider public. The Action will shed new light on the science of science and analyze the impact of research. Moreover, assessments informed by such metrics could lead to the hiring of better candidates and the selection of better project proposals. Therefore, they could have a long-term impact on the research process, benefiting society and the economy as a whole. Also, the use of domain-specific language for the machine-actionable description of academic metrics, as well as the standardization of APIs of metrics data providers, could make the assessment process more transparent and simpler, thus saving time. Furthermore, it will facilitate the integration of existing science of science tools and the development of new ones, as well as the application of artificial intelligence techniques. Additionally, the existence of

metrics based on Web 2.0 tools may encourage researchers to make their research results more transparent and change their communication practices. This could generate greater interest in academia within the wider society. Ultimately, the scientific and technological results of the Action, such as the domain-specific language for machine-actionable description of academic metrics, techniques for dealing with data quality, and metrics gaming, can be adopted and applied in other domains (see Tables 1, 2).

3.2 MEASURES TO MAXIMISE IMPACT

3.2.1 KNOWLEDGE CREATION, TRANSFER OF KNOWLEDGE AND CAREER DEVELOPMENT

The Management Committee (MC) members will implement the plan for knowledge creation, transfer and career development, supported by the Core Group Members of the Action. These members will play an active role in WGs, acting as scientific and training coordinators. They will be responsible for organising and facilitating the interdisciplinary cooperation between researchers, identifying and creating opportunities for holistic research approaches, and developing career opportunities and outcomes within and beyond the WGs. New knowledge will be created through collaboration between the Action participants with diverse backgrounds and expertise, inlcuding different research skills, ranging from theoretical to practical, different methodologies, and experience in various fields. This knowledge will be transferred internally to other Action members through presentations at regular WG meetings, and externally to non-Action members through three training schools and two open conferences organized as a part of the Action, as well as through the dissemination and exploitation channels described in Section 3.2.2 (Plan for dissemination and/or exploitation and dialogue with the general public or policy).

ECIs will be divided into small interdisciplinary teams, with a senior scientific mentor assigned to each group. The mentors will help the ECIs to organize their activities within the Action and to recognize opportunities for networking and career development, both within and outside the COST Action. Furthermore, senior scientific mentors will recommend ECIs from their groups for the “Fellow of ENFAIRAM” award, which will recognize the most active ECIs. The criteria for assessing Short Term Scientific Mission applications, which will be defined at the beginning of the Action, will prioritize collaboration between ECIs and senior researchers, as well as between participants with different levels of knowledge and from different regions. Besides the creation of knowledge, these STSMs will faciliate the knowledge transfer between STSMs participants (i.e., hosts and visitors), especially from senior researchers in EU countries to ECIs in ITCs. This knowledge transfer, as well as the networks established and the scientific results gained, will support the ECIs in their career development.

The Action will focus on organizing large, open meetings, where invited participants can have opportunities to benefit from networking opportunities, including with participants from outside the Action. Particular attention will be given to the themes addressed at

these meetings, which must balance the interests of academics and commercial metrics data providers.

The web repository of academic metrics is open to the addition of new metrics and discussion. This will enable knowledge tranfser beyond the Action. The Action members will ensure sustainability (i.e., by hosting and moderating of the repository for at least five years after the Action).

3.2.2 PLAN FOR DISSEMINATION AND/OR EXPLOITATION AND DIALOGUE WITH THE GENERAL PUBLIC OR POLICY

The dissemination and exploitation plan for the Action is created with two audiences in mind: the Action's members and the scientific community, as well as other interested stakeholders and individuals who are not participating in the Action.

The dissemination and exploitation plan is based on the following components:

- The Action website will enable the members to disseminate news relevant to the Action and will inform external stakeholders of the main events organized and the outcomes achieved. The basic structure of the website will also include the following:
  - a page for presenting the Action members, containing the members' personal profiles
  - a page for listing and advertising all the Action events (i.e., meetings, open conferences, training schools, calls for participation)
  - a page for depositing all the training and research material produced by the Action (i.e., presentations, results of the brainstorming sessions, lecturers, etc.).
  - a page for depositing deliverables of the Action
    - An annotated bibliography of relevant resources for the topic of the Action
    - A report on standardization of APIs for metrics data sources
    - A domain-specific language for machine-actionable notation for expressing academic metrics
    - The architecture of the distributed global research e-infrastructure and its relation with metrics data sources
    - A framework with criteria for evaluating the quality of the data in the metrics data source
    - A set of recommendations for detecting and dealing with gaming of academic metrics
- Dissemination material: invitations, leaflets, the Twitter feed, and a newsletter
- Mailing lists for interested parties and the Action members
- The scholarly communication through papers, articles, demonstrations and tutorials

- The participation and organization of meetings and events with non-Action members for promoting the reuse of the Action outcomes in professional applications

Moreover, the web register of FAIR academic metrics, with features for open discussion, will facilitate dissemination and exploitation of ideas for the science of science and academic metrics during the Action and beyond.

The KPIs for assessing the effectiveness of the dissemination activities are the following (until the end of the Action): 10,000 visitors of the Action website; 1,000 downloads of the Action deliverables; 1,000 user reactions to the Twitter activities; 2,000 disseminated invitations, leaflets, and newsletters; 1,000 mailing lists' subscribers; 40 scientific articles published; 5 open events organized; 3,000 visitors of the web register of FAIR academic metrics.

4 IMPLEMENTATION

4.1 COHERENCE AND EFFECTIVENESS OF THE WORK PLAN

4.1.1 DESCRIPTION OF WORKING GROUPS, TASKS AND ACTIVITIES

The Action participants will be included in three Working Groups (WG 1–3), reflecting the three main pillars described above (see Section 1.2.1), and contributing to the research coordination objectives stated in the Section 1.2.2.1. An additional fourth group will be dedicated to the coordination and dissemination of the Action's activities and outcomes. Therefore, WG4 will contribute to the capacity building objectives stated in the Section 1.2.2.2 and ensure a maximum visibility of the Action.

[WG1] Standardization of academic metrics and its data sources

Task 1.1 (preparation) Analysis of the state of the art

Activity 1.1.1 Identifying available metrics usage, metrics data sources, pros and cons of their APIs and supported formats: designing a characterization matrix; collecting and characterizing available web resources (documentation, APIs, papers, initiatives, etc.); designing a survey; disseminating a survey; analysing the survey results and resources.

Activity 1.1.2 Identifying available techniques and novel methods for standardization of formats, APIs and query languages for simple use of metrics data sources: designing a characterization matrix; collecting and characterizating available web resources (documentation, papers, blogs, initiatives, etc.); analysing the resources.

Activity 1.1.3 Identifying machine-actionable and domain-specific language notations, which may be used for expressing metrics: designing a

characterization matrix; collecting and characterizing available web resources (some techniques from legal informatics and computational law might be adopted for building the language for computational metrics); analysing the resources.

Task 1.2 (implementation) Standardization of the metrics data sources APIs

Activity 1.2.1 Analysing research e-infrastructures relations with metrics data sources

Activity 1.2.2 Specifying MDS API (metrics data sources' standard API): endpoints, functionalities, input and output format

Activity 1.2.3 Specifying AcaMet domain-specific language for expressing how metrics should be automatically calculated based on metrics data sources: selection of language notations for building a domain-specific language for expressing metrics; definition of AcaMet domain-specific language

Task 1.3 (exploitation) Building a roadmap for machine-actionable academic metrics

Activity 1.3.1 Developing a vision for an architecture of a distributed global research e-infrastructure and its relation with metrics data sources based on the standard API

Activity 1.3.2 Building a roadmap for interoperability of metrics data sources and platforms for the science of science and academic assessment

Activity 1.3.3 Making examples of representing metrics in the AcaMet language

[WG2] Quality of metrics data sources

Task 2.1 (preparation) Analysis of the state of the art

Activity 2.1.1 Identifying available techniques and practices for representation of data quality and provenance, and assigning verifiable claims: designing characterization matrix; characterization of available web resources (i.e., documentations, papers, project reports, W3C standards, initiatives, etc.); designing a survey; dissemination of a survey; analysing of the survey results and characterized resources.

Activity 2.1.2 Identifying available techniques and novel methods for detecting data gaming which might be applied in detecting academic metrics gaming: designing characterization matrix; characterization of available web resources (the available techniques in other domains, such as gaming in search engine relevance scores, should be analyzed and adopted for the metrics data domain); analysing of the resources.

Activity 2.1.3 Identifying available techniques and methodologies for comparing coverage and comprehensiveness of databases and indexes: designing

characterization matrix; characterization of available web resources (the available techniques for assessment of coverage and comprehensiveness in other domains, such as scholarly outputs databases and search engine indexes, should be analyzed and adopted for the metrics data domain); analysing of the resources.

Task 2.2 (implementation) Development of frameworks for assessing reliability of metrics data sources

Activity 2.2.1 Creating an evaluation framework with criteria for the data quality in the metrics data source (e.g., provenance tracking, data verification process status, verifiable claims).

Activity 2.2.2 Creating a framework for assessment of metrics data providers databases' coverage and comprehensiveness.

Activity 2.2.3 Developing recommendations for detecting and dealing with gaming of academic metrics

Task 2.3 (exploitation) Case studies for assessing reliability of metrics data sources

Activity 2.3.1 Validation of the developed framework by assessing the data quality of a few popular metrics data providers databases

Activity 2.3.2 Validation of the developed framework by assessing comprehensiveness of a few popular metrics data providers databases

[WG3] FAIRness of academic metrics

Task 3.1 (preparation) Specification of a web register of metrics data sources and metrics

Activity 3.1.1 Use case analysis

Activity 3.1.2 Specifying a set of functionalities

Activity 3.1.3 Analyzing free and customized solutions, which may be used for the development of the web register

Task 3.2 (implementation) Development of a web register of FAIR metrics (ENFAIRAM)

Activity 3.2.1 Integration, customization and deployment of a selected set of solutions

Activity 3.2.2 Prescribing and documenting processes and conventions for adoption of FAIR principles in cataloguing of metrics in the repository

Activity 3.2.3 Prescribing and documenting processes and rules for moderating discussions in the web register

Task 3.3 (exploitation) Filling in the web register

Activity 3.3.1 Cataloguing existing metrics and data sources

Activity 3.3.2 Moderating discussions. This activity will be continued for at least five years after the end of the Action.

Activity 3.3.3 Defining new academic metrics: identifying gaps for missing sources or metrics for some research output or activity, taking into account different practices by numerous scientific disciplines; introducing new metrics based on Web 2.0 data sources (academic metrics 2.0); cataloguing new metrics

[WG4] Coordination and dissemination

Task 4.1 Enhancement of participation in the Action

Activity 4.1.1 Defining strategies for improving the active participation of the members

Activity 4.1.2 Assigning senior researchers as mentors to ECIs and organizing process of assigning “Fellow of ENFAIRAM” status awarded to the most active ECIs

Activity 4.1.3 Expanding the initial Action Network taking into account the balance in terms of stakeholders, gender, and level of experience

Task 4.2 Coordination and monitoring the Action

Activity 4.2.1 Organization of meetings/conferences/training schools: defining topics, agendas, involvement of the Action members in the meetings and training schools, defining modalities, which will enhance knowledge transfer and support goals of the Action, coordination with local organizers.

Activity 4.2.2 Management of STSMs and ITC Conference Grants: defining the criteria to rank the applications for STSMs and ITC Conference Grants, to issue the calls and to propose to the MC the applications to be funded.

Activity 4.2.3 Coordination of quality assurance process for the Action outputs and deliverables

Activity 4.2.4 Monitoring the participation of the Action Members: fostering balance in terms of stakeholders, gender, and level of experience, encourage involvement of ITCs and ECIs, encourage collaboration and joint funding applications, as well as submission of joint research articles.

Task 4.3 Dissemination

Activity 4.3.1 Creation a mailing list of national and European stakeholders, who may be interested in the Action

Activity 4.3.2 Building annual communication plans, which should be approved by the MC

Activity 4.3.3 Designing and moderating the Action website and its content

Activity 4.3.4 Designing and disseminating the Action news via various channels (leaflets, newsletters, Twitter, news, etc.)

Activity 4.3.5 Coordinating the translation of the most important Action deliverables into other European languages

4.1.2 DESCRIPTION OF DELIVERABLES AND TIMEFRAME

[WG1]

D1.1 An annotated web bibliography of systematically classified 200+ scientific and technological resources related to the research impact metrics (**M12** and updated during the project)

D1.2 Metrics data sources' standard API (MDS API) (**M24**)

D1.3 The AcaMet domain-specific language for expressing computational research impact metrics (**M36**)

D1.4 A roadmap for interoperability of metrics data sources and platforms for the science of science and academic assessment, including standardization of APIs of metrics data sources and a vision for an architecture of a global research e-infrastructure and its relation with metrics data sources (**M42**)

D1.5 Examples of representing metrics in the AcaMet language (**M45**)

[WG2]

D2.1 A framework with criteria for evaluating the data quality in the metrics data source (**M24**)

D2.2. A framework for assessing metrics data sources' coverage and comprehensiveness (**M36**)

D2.3 A set of recommendations for detecting and dealing with gaming of research impact metrics (**M42**)

D2.4 A report on case studies for assessing reliability of popular metrics data sources (**M45**)

[WG3]

D3.1 The ENFAIRAM web register on research impact metrics deployed at a public address (**M36**)

D3.2 Guidelines on making research impact metrics FAIR

D3.3 The active ENFAIRAM repository: 50+ catalogued research impact metrics in ENFAIRAM, 1,000+ visitors, and 100+ discussion activities (i.e., comments on and reviews of metrics) (**M48**)

D3.4 Definition of at least five newly defined research impact metrics (**M45**)

[WG4]

D4.1 The Action website deployed at a public address (**M3**), with the Action participants profiles (**M24**), the Action meetings minutes, materials and deliverables (**M48**)

D4.2 Eight or more meetings organized, including working group (WG) meetings and open conference with international participation (**M48**).

D4.3 A leaflet (**M6**) describing the Action and its activities, methodology and objectives to be distributed in conferences and other initiatives (2,000 items will be distributed until **M48**)

D4.4 Action e-Newsletter (one issue per year - **M9**, **M21**, **M33**, **M45**)

D4.5 Three training schools organized (**M21** - WG2, **M33** - WG3, **M45** - WG1)

D4.6 One call per year for STSMs (four in total - **M6**, **M18**, **M30**, **M42**) with at least 50 (in total) realized and funded STSMs described by a short scientific report (three pages)

D4.7 One call per year for an ITC Conference Grant (four in total - **M9**, **M21**, **M33**, **M45**) with at least 20 (in total) accepted applications

D4.8 40+ publications in journals or conferences authored by Action Members from at least two countries (**M48**)

D4.9 Final publication including the main research results achieved in the Action (**M48**)

4.1.3 RISK ANALYSIS AND CONTINGENCY PLANS

See Table 3.

4.1.4 GANTT DIAGRAM

The first year involves preparatory tasks, while implementation tasks will be carried out in the second and third years. The final year of the Action will be used to consolidate the research and network outcomes and complete tasks related to exploitation (see Table 4).

COST Missions and Policies

The ENFAIRAM Action is conceived to fully address the COST Mission of enabling breakthrough scientific developments by establishing a network of researchers with complementary expertise whose collaboration can go beyond the Action. The Action defines hot topics and challenges whose addressing should lead to better adoption and usage of research impact metrics based on Web 2.0. Addressing these challenges could be a basis for establishing new approaches for the science of science, as well as for changing academic assessment policies leading to positive incentives for further adoption of open science, and further adoption of new scholarly communication channels with academic and non-academic communities. Moreover, assessment of research impact based on various Web 2.0 channels could lead to hiring better candidates and selection of better project proposals, thereby contributing to strengthening European research and innovation capacities. Moreover, providers of metrics and data sources could benefit from this Action and increase the discoverability of their data through standardized APIs and data formats. Scientometrics based on Web 2.0 is a more than 10-year-old paradigm, but besides some initiatives, declarations, and projects, its adoption is still in the early stage.

Therefore, the implementation of a COST Action on this topic is timely, i.e., the plan and roadmap for transition to Scientometrics 2.0 is needed, including standardization of metrics data sources in communication and data quality. The network of proposers includes:

1. Researchers, who will bring expertise in theoretical and practical aspects of informetrics, information, computer science fields, and science of science.
2. Research software engineers, who will bring expertise in technical and practical aspects of building and maintaining research e-infrastructures, APIs, and GUI.
3. Librarians, who will bring expertise in information science and cataloguing scientific outputs and activities.
4. Metrics data providers' representatives, who will bring data providers' expertise on existing challenges, how these challenges can be addressed, what is needed to do that, and when it could be achieved.
5. Policymakers, who will bring expertise on the group and individual assessment of research outputs and activities, as well as experience in producing some undesired incentives by introducing some metrics for assessment of research impact.

Different perspectives on the topic will be sought from the previously listed stakeholders to find the most comprehensive and effective solutions for overcoming the identified challenges.

To achieve its mission, the ENFAIRAM Action will fully exploit all the networking tools offered by the COST Framework in accordance with the COST policies and rules:

1. The Action will promote an “open and inclusive participation” in all the Action networking activities, and will encourage and foster the active participation of the Network members through “calls for application”, assigning senior mentors to ECIs, awarding “Fellow of ENFAIRAM” status to the most active ECIs, preferring open, large meetings with more opportunities to networking and build new research collaborations. Moreover, the meetings will be based on brainstorming sessions / team building activities / working sessions, and, therefore, engage participants to work together. This environment might boost the creation of new project ideas and new research opportunities. At the beginning of the Action, criteria for distributing and balancing the grants and the benefits among the participants and the countries, thus promoting the participation of ECI’s, people from ITCs, and gender balance will be defined.
2. The Action will support the dissemination of results. There will be a special working group (WG4) to encourage the Action members to start joint research activities, to organize quality checks before some output is ready for publishing, to ensure the acknowledgment of the Action in the achieved outcomes, and to help in its dissemination. Moreover, the Action will organize open conferences with international participation, where it will be possible to disseminate part of the Action's research outcomes. At the end, the WG4 members will constantly monitor other dissemination opportunities, such as organizing special issues in international journals, and workshops in international conferences, which can promote ENFAIRAM outcomes outside of the Network.
3. The Action will invite ITC researchers to join the Action and try to balance the number of researchers from ITCs and non-ITCs, who will benefit from the Action networking tools (i.e., through targeted invitations, awarding grants, criteria for STSM applications assessment, etc.). Moreover, the majority of the meetings, and the training schools will be organized in ITCs, thus promoting the participation of local researchers and the visibility of this Action and the COST framework in general. The MC will give higher priority to STSM applications involving ITCs, and at least four calls for assigning conference grants to ITC researchers will be issued.
4. The Action will support the participation of non-COST Countries in COST activities. The network of proposers already includes one NNC and one IPC. Moreover, the Action proposers have strong relationships with researchers affiliated with organizations located in NNCs and IPCs, and these connections will be used for further enlargement of NNCs and IPCs representatives in the Action, if there is a mutual benefit from their participation in the Action taking into account their expertise.

Recent Developments

Since the submission of the original grant proposal in 2021, several important developments have taken place that significantly enrich the context of the proposed work.

Emerging Initiatives in Research Assessment

New initiatives relevant to research assessment reform have emerged, offering contemporary frameworks and infrastructures that were not yet mature or widely recognized in 2021. The Global Research Assessment Platform Open Science project (GraspOS, https://graspos.eu/) is a European initiative developing an open, federated infrastructure to support next-generation research assessment aligned with open science principles (Xenou et al. 2025). GraspOS aims to provide data, tools, services, and guidance that enable broader and more responsible evaluation practices beyond traditional metrics. Notably, work under GraspOS includes frameworks for comprehensive researcher profiles and landscape analyses of research assessment practices, reflecting policy reform priorities such as those articulated by the Coalition for Advancing Research Assessment (CoARA, https://coara.eu/) (Xenou et al. 2025).

The Future of Research Evaluation is a global initiative that stimulates global reform of research assessment by moving beyond narrow, metrics-driven evaluation toward more inclusive, transparent, and context-sensitive approaches (de Rijcke et al. 2023). It seeks to broaden what counts as research quality and contribution, encourage collective action across stakeholders, share and scale good practices, and support experimentation and learning, particularly in response to open science, interdisciplinarity, and emerging technologies such as AI (de Rijcke et al. 2023).

The CoARA initiative is a coalition of research organisations, funders, and assessment authorities committed to reforming research assessment. Building on the Agreement on Reforming Research Assessment, CoARA promotes more holistic and qualitative evaluation methods supported by the responsible use of quantitative indicators. It hosts working groups (e.g., on responsible metrics) and produces conceptual frameworks aimed at replacing proprietary, narrow metrics with open, transparent, and community-governed systems (Xenou et al. 2025).

Evolving Scholarly Communication on Social Media

The social media landscape for academic exchange has also changed since 2021. Although Twitter (now X) has historically been a central platform for scholarly communication and dissemination, recent trends show a notable shift among researchers toward alternative platforms (Quelle et al. 2025). For example, one study using a unique dataset of engineering PhD holders shows that professional networking via LinkedIn is strongly shaped by sector and mobility, with higher uptake and larger networks among those in industry and those with international collaboration or migration experience,

underscoring both the potential and limitations of social media data for understanding academic exchange (Baruffaldi et al. 2017). Similarly, research on scholarly posting practices indicates that the newer platform Bluesky now generates higher engagement (e.g., likes, reposts, replies) for research-related content than X, with many scientists reporting greater depth of academic discussion there (Quelle and Bovet 2025).

Complementary work has analysed the migration of academic users from Twitter to Bluesky, indicating substantive movement of scholarly networks and engagement patterns (Quelle et al. 2025). Such evidence suggests that assumptions made in 2021 about Twitter's centrality to scientific networking may no longer hold, and that Bluesky and similar platforms (e.g., Mastodon) should be factored into studies of scholarly communication and impact.

Growing Evidence on Academic Networking Sites in Research Assessment

A substantive body of research has matured regarding the value and limitations of academic networking sites, such as ResearchGate, Academia.edu, and other platforms, in the context of research assessment. For example, empirical studies have examined altmetric and bibliometric correlations on Academic Social Networking Tools (ASNTs), showing positive relationships between altmetric indicators on platforms like ResearchGate and traditional bibliometric measures, suggesting that online visibility can relate meaningfully to scholarly impact (Adriaanse et al. 2024).

Additionally, literature reviews of ResearchGate and Academia.edu highlight their roles as socio-technical systems supporting scholarly communication, reputation building, and alternative indicators, while also calling for more nuanced research into their functions and implications for assessment (Manca 2018). These studies contribute to a stronger evidence base on how academic networking sites can complement traditional evaluation practices, an evolution from earlier discussions focused primarily on Twitter-based altmetrics (e.g., studies on tweeting and citations) (Adriaanse et al. 2024).

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The authors have declared that no competing interests exist.

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Table 1.

Short-term impacts.

Impact	KPI
Acceleration of research through the creation of a multidisciplinary network of experts with different expertise and experience levels in various research areas of informetrics, information science, computer science, and social sciences (**scientific impact**)	• 40+ (at least 40) joint interdisciplinary publications ◦ 10+ papers in highly ranked journals ◦ 30+ papers at international conferences • 5+ joint project proposals • The expansion of the network by involving 10+ new research groups • 40+ STSMs, 10+ WG meetings, 2 open conferences, 3 training schools
Generation of new technologies through the adoption of emerging technologies to the field of this Action (**technological impact**)	• A prototype of a domain-specific language for machine-actionable notation for expressing academic metrics • The architecture of distributed global research e-infrastructure and its relation with metrics data sources
Standardization in the field of academic metrics (**technological impact**)	• A report on the standardization of APIs for metrics data sources • A framework with criteria for evaluating the data quality in the metrics data source • A set of recommendations for detecting and dealing with gaming of academic metrics
Enhanced discoverability of the existing resources in the action field (**scientific and technological impact**)	• An annotated web bibliography of systematically classified 200+ scientific and technological resources related to the academic metrics research topic
Promotion of collaboration between academia and industry (**scientific and technological impact**)	• The participation in or the organization of 3+ events involving representatives from both academia and industry (conferences, training schools, workshops, the Action meetings, etc.)
Improving awareness about existing academic metrics, its issues and importance (**socioeconomic impact**)	• Web register of FAIR academic metrics with open discussion features ◦ 50+ catalogued academic metrics ◦ 1,000+ visitors and 100+ discussion activities (i.e., comments and metrics' reviews)

Table 2.

Long-term impacts.

Impact	KPI
New research activities, funding applications, job opportunities for ECIs, and visiting activities after the Action is closed (**scientific**, **technological, and socioeconomic impact**).	Collaborations established through the Action will continue beyond its end date, with research results being published and joint funding applications submitted.
Decreasing efforts of academic evaluators and informetricians in the science of science (**technological and socioeconomic impact**).	Automatization of the metrics calculation process through the adoption of developed standards and technologies (see the deliverables D1.2 and D1.3) by metrics data sources.
Encouraging researchers to change their practices, to generate more transparent results, and to change communication practices with other academics and the wider society (**socioeconomic impact**).	Introducing academic metrics based on Web 2.0 in the academic assessment for hiring candidates and the selection of projects.
New expertise and new skills for the Action Members and their institutions and countries (**scientific, technological, and socioeconomic impact**).	Using expertise and skills for teaching and innovation activities by ECIs, who participated in the Action.

Table 3.

Risk analysis and Contingency Plans.

Risk	Contingency plan
Lack of understanding between participants coming from different regions or disciplines (research-related; medium)	The practices and publication patterns of researchers, as well as national and institutional policies, vary across Europe. Therefore, the Action participants may have different views on the purpose of academic metrics. However, the WG leaders are capable of fostering multidisciplinary work, connecting researchers with different backgrounds and converting membership composition into the strength of this Action.
Low quality outputs (research-related; medium)	Senior researchers will be assigned as mentors to ECIs, supporting them to produce high-quality outputs. Furthermore, the regular WG and MC meetings and mailing lists throughout the Action will enable the early presentation of outputs to the community and the collection of feedback for the improvement of outputs prior to the publication of the final version. WG4 will be responsible for coordinating the process of publishing the Action's outputs.
Low participation in the Action meetings (Network diversity; low)	Given the size of the Action proposal network, the likelihood of this risk is quite low. Moreover, there is a strategy for further enlargement of the network (see the Section 1.2.2.2)
Low participation from stakeholders (Network diversity; low)	The proposed network already involves representatives of each of the five identified groups of stakeholders. Moreover, there is a plan for boosting involvement of stakeholders (see the Section 2.2.2)
Low quality deliverables (Action management; low)	This action involves a combination of experienced researchers and ECIs. Senior researchers will act as mentors for ECIs, coordinating their work and improving its quality. Furthermore, the regular WG and MC meetings and mailing lists throughout the Action will enable the early presentation of deliverables to the community for feedback on how to improve them. WG4 will be responsible for coordinating the publishing process for the Action's deliverables.
Delay in the production of deliverables (Action management; medium)	The MC will be responsible for monitoring the progress of the Action and ensuring that deadlines are met. Should unacceptable delays occur, immediate action will be taken, such as organizing an urgent virtual meeting, enlarging the team responsible for the deliverable or finding a substitute for the task leader.
Conflicts (Action management; low)	Should a conflict emerge among two or more partners, the MC will address it immediately by organizing an urgent virtual meeting and trying to mediate and to find a solution.

Table 4.
GANTT diagram.

			Year 1				Year 2				Year 3	
WG	**Task**	**Activity**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**
WG1	**T1.1**	**A1.1.1**				D1.1						
		A1.1.2				D1.1						
		A1.1.3				D1.1						
	T1.2	**A1.2.1**										
		A1.2.2								D1.2		
		A1.2.3										
	T1.3	**A1.3.1**										
		A1.3.2										
		A1.3.3										
WG2	**T2.1**	**A2.1.1**				D1.1						
		A2.1.2				D1.1						
		A2.1.3				D1.1						
	T2.2	**A2.2.1**								D2.1		
		A2.2.2										
		A2.2.3										
	T2.3	**A2.3.1**										
		A2.3.2										
WG3	**T3.1**	**A3.1.1**										
		A3.1.2										
		A3.1.3										
	T3.2	**A3.2.1**										
		A3.2.2										
		A3.2.3										
	T3.3	**A3.3.1**										
		A3.3.2										
		A3.3.3										
WG4	**T4.1**	**A4.1.1**										
		A4.1.2										
		A4.1.3										
	T4.2	**A4.2.1**	M		M			M	TS	M		M
		A4.2.2		ST	CG		ST	CG			ST	CG
		A4.2.3										

		A4.2.4										
	T4.3	**A4.3.1**										
		A4.3.2										
		A4.3.3	D4.1									
		A4.3.4		D4.3	D4.4				D4.4			
		A4.3.5										
Legend		**WGX** - Working Group X; **TX.Y** - Task Y in the Working Group X; **AX.Y.Z** - Activity Z in the Task Y in the Working Grou Working Group X (D1.1. is the only one deliverable resulting from two WGs efforts); **TS** - Training School (**D4.5**); **M** - T together with WG meetings and **O** (Open conference with international participants) to save the budget (**D4.2**); **ST** - Sh **CG** - ITC Conference Grants call (**D4.7**)										