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Abstract

This deliverable report provides information on the development of the GraspOS tools and services, which are federated in the GraspOS infrastructure. The report also contains references to the code repositories and the documentation websites of the respective software packages.



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Abbreviation List

- **API:** Application Programming Interface
- **ARC:** Athena Research Center
- **CiTO:** Citation Typing Ontology
- **CoARA:** Coalition for Advancing Research Assessment
- **CoP:** Community of Practice
- **CRIS:** Current Research Information System
- **CS:** Computer Science
- **CWTS:** Centre for Science and Technology Studies - Universiteit Leiden
- **DBLP:** Digital Bibliography & Library Project
- **DOAB:** Directory of Open Access Books
- **DOI:** Digital Object Identifier

- **EOSC:** European Open Science Cloud
- **GRNET:** National Infrastructures For Research and Technology
- **IIS:** Information Inference Service
- **INRIA:** National Institute for Research in Digital Science and Technology
- **KGE:** Knowledge Graph Embeddings
- **LLM:** Large Language Model
- **OA:** Open Access
- **OI4RRA:** Open Infrastructures for Responsible Research Assessment
- **OPERAS:** Open scholarly communication in the European Research Area for Social sciences and Humanities.
- **ORCID:** Open Researcher and Contributor Identifier
- **OS:** Open Science
- **OS-aware RRA:** Open-Science-aware Responsible Research Assessment
- **OSM:** Open Science Monitoring
- **QoS:** Quality of Service
- **PRISM:** Peer Review Information Service for Monographs
- **RAiD:** Research Activity Identifier
- **RDF:** Resource Description Framework
- **REST:** Representational State Transfer
- **RRA:** Responsible Research Assessment
- **SDE:** Scholarly Data Enrichment
- **SSH:** Social Sciences and Humanities
- **TSV:** Tieteellisten Seurain Valtuuskunnasta (Federation of Finnish Learned Societies)
- **UNIBO:** University of Bologna

1. Executive Summary

Research assessment processes are important for informing decisions on funding, hiring, promotions, and strategic planning within the research community. However, conducting research assessment is challenging, especially when striving to prioritise responsible practices and consider Open Science aspects.

GraspOS aims to develop, enhance, and deliver practical tools and services to support research assessment processes, paving the way for a reform towards OS-aware Responsible Research Assessment (OS-aware RRA). These resources will comprise key components of the federated infrastructure that the GraspOS project is implementing.

This report supplements the release of the beta versions of the GraspOS tools and services. More specifically, it provides the necessary background to help readers understand the landscape of tools and services which are relevant to the project, introducing relevant terminology and a classification scheme for these resources that takes into consideration their main functionalities and use cases. Additionally the report offers an overview of the current array of GraspOS tools and services also outlining basic implementation details and the planned development activities until the end of the project. As outlined in the report, most tools and services are in an advanced beta stage, with only a few exceptions that are still in the early prototyping phase, having been developed from scratch specifically for this project. Finally, the report provides references to all code repositories and supporting materials, serving as a comprehensive entry point for anyone interested in accessing the source code and relevant documentation.

2. Introduction and Background

Research assessment processes, which are used to evaluate the quality, impact, and significance of research activities and outputs, are essential for informing decisions related to funding, hiring, promotions, and strategic planning within the broader research community. However, conducting research assessment can be tedious and time-consuming for evaluators, who are often overwhelmed by other research-related responsibilities. Moreover, prioritising responsible and inclusive evaluation practices while appropriately considering Open Science (OS) activities is challenging, and evaluators could greatly benefit from guidance. GraspOS aims to develop, enhance, and deliver a suite of practical tools and services designed to address these challenges and facilitate OS-aware Responsible Research Assessment (OS-aware RRA).

More specifically, GraspOS is developing a federated infrastructure designed to aggregate open resources that facilitate the implementation of necessary policy reforms. Figure 1 presents a high-level conceptual architecture of the infrastructure. As highlighted in the figure, tools and services are significant components. The GraspOS infrastructure facilitates the discoverability of its tools and services mainly through the Tools¹ and the Services² Catalogues. These catalogues not only provide convenient web-based user interfaces and APIs but also ensure compatibility with EOSC-related specifications. More details on the architectural design of the GraspOS infrastructure can be found in Deliverables D4.1³ and D4.2⁴, while information related to its implementation can be found in Deliverables D4.3⁵ and D4.4⁶.

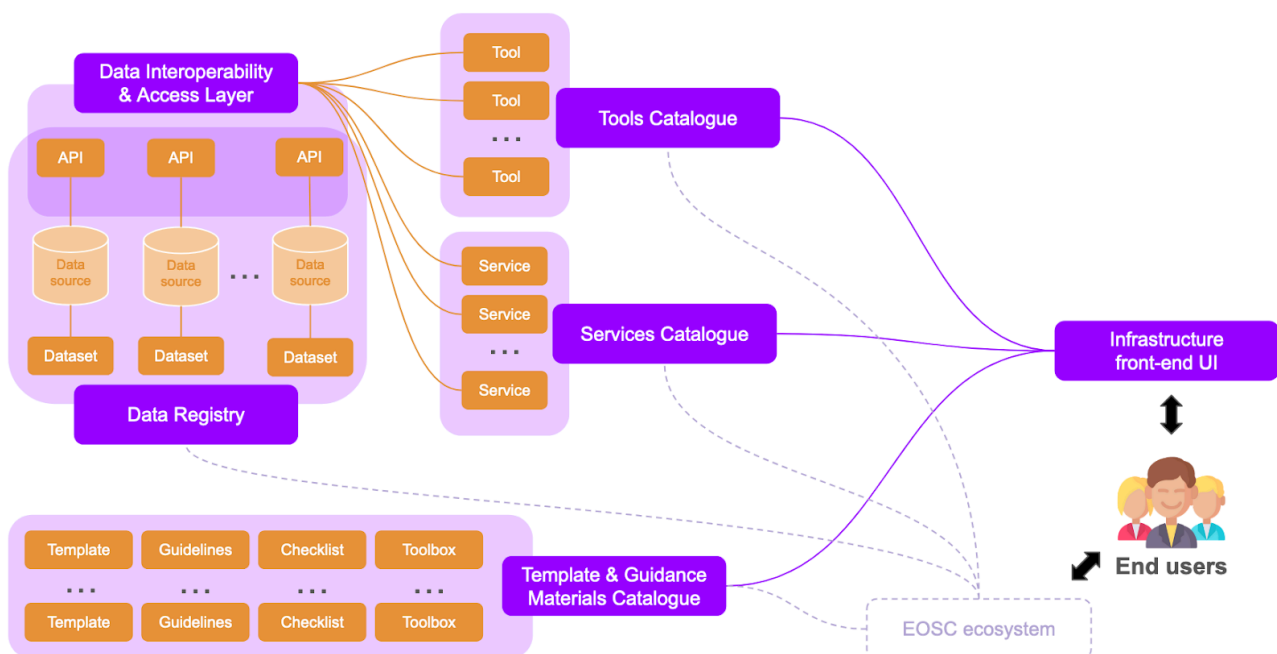


Figure 1 Overview of the GraspOS infrastructure

At this point, it is essential to explain the main difference between tools and services according to the conventions we have adopted for the project. Both terms refer to types of software; however, each serves a different purpose and has distinct characteristics. We use the term **“tool”** to refer to a stand-alone piece of software, such as a script, executable, or even workflow, which can be used by installing and executing it locally on a computer or

¹ GraspOS Tools Catalogue: <https://zenodo.org/communities/graspos-tools/>

² GraspOS Services Catalogue: <https://graspos-services.athenarc.gr/>

³ GraspOS Deliverable 4.1: <https://zenodo.org/doi/10.5281/zenodo.8302197>

⁴ GraspOS Deliverable 4.2: <https://zenodo.org/doi/10.5281/zenodo.13618531>

⁵ GraspOS Deliverable 4.3: <https://zenodo.org/doi/10.5281/zenodo.10475567>

⁶ GraspOS Deliverable 4.4: <https://zenodo.org/doi/10.5281/zenodo.13617815>

computational cluster owned by the end user to conduct a particular type of analysis and/or produce data. The term **“service”**, on the other hand, refers to a piece of software that provides a set of functions or features for the end user, typically hosted on a remote server and accessed via a web interface or API. Essentially, the service provider aims to offer it in a 24/7 manner, guaranteeing the respective Quality of Service (QoS), such as the service availability.

Any individual using a GraspOS tool or service is, by definition, considered a GraspOS infrastructure end user. Accessing a GraspOS service, of course, does not require any special technical skills or computational resources from the end user. On the other hand, using a GraspOS tool requires technical expertise for installation and deployment, as well as computational resources from the end user. Since all GraspOS services are open source, it is also possible for stakeholders to deploy an instance of a GraspOS service in another location.

Additionally, it is worth mentioning that the first list of tools and services, to be included in the GraspOS infrastructure, was created based on the competencies of the project's technical partners. However, the GraspOS infrastructure is planned to act as an open and evolving ecosystem; hence, the list of assessment resources currently included in the infrastructure will always be subject to changes based on a clear resource inclusion policy (more information can be found in D4.2). At this stage, the focus is on making an initial set of tools and services available and testing them in practice. In this report, we will discuss this initial set of resources. Of course, many other similar tools and services exist, some of which may be registered to the GraspOS Tools & Services Catalogues in the near future. This is particularly likely for those developed, configured, or adapted by GraspOS pilot partners.

Finally, it is worth mentioning that some of the tools and services are still in their alpha or beta versions, and the respective code repositories and/or documentation websites are not publicly available at this time. However, they will become available in the next months.

3. Tools and Services Classification

According to its project plan, GraspOS primarily focuses on tools and services for data enrichment and Open Science monitoring, with significant interest also directed toward data services that can support research assessment processes (especially for those focused on OS-aware RRA). In this context, a preliminary classification of the tools and services of interest was introduced in D3.1⁷ ('Tools & Services Landscape Report') to present the state-of-the-art landscape. Following the publication of that report, GraspOS experts refined the initial

⁷ GraspOS Deliverable 3.1: <https://zenodo.org/doi/10.5281/zenodo.8302169>

classification, developing enhanced schemes for categorising GraspOS tools and services. The next sections outline the respective classification schemes.

3.1. Tools Classification Taxonomy

Table 1 summarises the two-level taxonomy currently used by GraspOS for the classification of tools that can be valuable in the context of OS-aware RRA.

Table 1 Overview of the GraspOS Tools Classification Taxonomy

Category	Subcategory
Scholarly Data Enrichment (SDE) Tools	(Tools for enrichment with) Missing attributes
	(Tools for enrichment with) Indicators
	(Tools for enrichment with) Missing links & semantics
Open Science Monitoring (OSM) Tools	(Monitoring tools for) Researchers
	(Monitoring tools for) Institutions
	(Monitoring tools for) Countries
	General (monitoring tools)

The Scholarly Data Enrichment (**SDE**) *category* contains tools designed to enrich scholarly data sources with missing information that is valuable for OS-aware research assessment. The “*Missing attributes*” subcategory includes tools that support the enrichment of scholarly (meta)data records related to research outputs and other research-related entities (e.g., institutions, researchers) with missing metadata. The “*Indicators*” subcategory refers to tools aimed at enriching scholarly (meta)data records related to research outputs and other research-related entities (e.g., institutions, researchers) with a variety of metrics and indicators that capture (a) the usage of research outputs (e.g., article views/downloads, accounting data of research services), (b) their uptake and impact from different perspectives, (c) Open Science uptake, and (d) other types of scientific merit. Finally, the “*Missing links & semantics*” subcategory contains tools to identify missing links between scholarly (meta)data records (e.g., authorship links, citation links, affiliation links) and address missing semantics of existing links (e.g., contribution roles for authorship links, citation intent).

The **OSM** *category* includes tools offering metrics, indicators, visualisations, information, and evidence to facilitate OS monitoring from various perspectives and at different levels. More

specifically, tools in the “*Researchers*” subcategory focus on monitoring OS practices at the level of individual researchers or researcher groups. Similarly, tools in the “*Institutions*” and “*Country*” subcategories focus on OS monitoring at the level of research-performing or funding organisations and at the level of countries, respectively. Finally, we have included a “*General*” subcategory for tools that cannot be specifically classified within the previous subcategories (e.g., tools for monitoring openness at the level of research products or services).

3.2. Services Classification Taxonomy

Table 2 summarises the two-level taxonomy that is currently used by GraspOS for the classification of services that can be valuable in the context of OS-aware RRA.

Table 2 Overview of the GraspOS Services Classification Taxonomy

Category	Subcategory
Scholarly Data Enrichment (SDE) Services	(Services for enrichment with) Missing attributes
	(Services for enrichment with) Indicators
	(Services for enrichment with) Missing links & semantics
OS Monitoring (OSM) Services	(Monitoring services for) Researchers
	(Monitoring services for) Institutions
	(Monitoring services for) Countries
	General (monitoring services)
Data Services	(Generic) Scholarly data resources
	Assessment registries

The explanation for the first two categories (**SDE and OSM Services**) is exactly the same as those provided for the respective tool categories presented in Section 3.1. The **Data Services** category contains services that collect and share (meta)data needed by research assessment processes. The “*Scholarly data resources*” subcategory encompasses collections of structured information about generic scholarly knowledge, as well as datasets specifically designed for specialised research analytics purposes. These resources make available bibliographical metadata and other similar types of information. The “*Assessment registries*” subcategory, on the other hand, includes registries that collect information related to the design and

execution of research assessment events, capturing past experiences in research assessment and, most importantly, enabling transparency in the respective processes.

3.3. Connection to Other Classification Schemes

For this deliverable, we have adopted a classification scheme for research-assessment-related tools and services based on their primary functionality. It is important to note that other classification criteria could also be used for categorising such resources, and these classifications can be complementary.

A notable case is the classification being developed by CoARA's OI4RRA working group,⁸ which follows a different approach. It focuses on the architectural view of a global ecosystem of open infrastructures to support research assessment and attempts to classify the respective components of a set of tiers which are essential for the ecosystem. This approach considers a different level of granularity (it is more coarse-grained) and, in that sense, is (to some extent) complementary to the classification presented by GraspOS. The tools and services covered by the GraspOS classification fit within some of the tiers in the OI4RRA classification, while other tiers in the OI4RRA scheme cover components which are outside the scope of GraspOS (e.g., PID providers). In any case, OI4RRA's work is still ongoing and GraspOS experts are closely following the respective developments to ensure that their work aligns with the outputs of OI4RRA.

⁸ OI4RRA ("Towards Open Infrastructures for Responsible Research Assessment") CoARA working group: <https://coara.eu/coalition/working-groups/wg-towards-open-infrastructures-for-responsible-research-assessment-oi4rra/>

4. GraspOS Tools

This section presents implementation details for the various tools currently hosted by the GraspOS infrastructure. In Section 4.1, we provide an overview of all tools, while in Section 4.2, we elaborate on the main functionalities to be provided by each tool, along with their development plans and current status. Finally, in Section 4.3, we include references to the respective code bases and documentation materials.

4.1. Overview

Table 3 provides an overview of the tools currently available through the GraspOS infrastructure. For each tool, the table lists the primary GraspOS partner responsible, as well as the main category under which the tool is classified (refer to Section 3.1 for more details on the classification scheme). All tools listed are being developed or extended as part of the GraspOS project and have an entry in the GraspOS Tools Catalogue.⁹ The tools are ordered alphabetically by name in the table.

Table 3 Overview of the GraspOS tools

Tool name	Partner resp.	Category
BIP! Citation Classifier	ARC	Scholarly data enrichment > Missing links & semantics
BIP! NDR workflow	ARC	Scholarly data enrichment > Missing links & semantics
BIP! Ranker	ARC	Scholarly data enrichment > Indicators
BIP! Scholar Indicators Calculator	ARC	Scholarly data enrichment > Indicators
Metrics	OPERAS	OS monitoring > General
OpenAIRE IIS Text Mining modules	OpenAIRE	Scholarly data enrichment > Missing attributes
Semantic Citation Classifier	UniBo	Scholarly data enrichment > Missing links & semantics
SOFTware-Sync	INRIA	Scholarly data enrichment > Missing attributes
SOFTware-Vis	INRIA	OS monitoring > General

⁹ GraspOS Tools Catalogue: <https://zenodo.org/communities/graspos-tools/> (see also D4.2 & D4.4).

4.2. Main Functionalities and Development

In this section, we elaborate on the main functionalities offered by each of the GraspOS tools, the current implementation status, and the high-level roadmap of development activities.

4.2.1. BIP! Citation Classifier

Scope & Main Functionalities: The BIP! Citation Classifier is a software library written in Python that implements various state-of-the-art algorithms to classify citations based on their intent (e.g., sciBERT¹⁰). The library relies on the citation context found in scientific publications. Specifically, the text surrounding a reference is given as an input, and the library classifies the respective citation according to its intent, based on a well-established citation classification ontology. This information is useful for citation network analysis tasks and the calculation of related indicators.

Implementation: This tool has been implemented from scratch in the context of the GraspOS project. A first alpha version has already been produced, and a mature version is expected to be released by the end of the project.

4.2.2. BIP! NDR Workflow

Scope & Main Functionalities: This software includes the computational workflow that is able to create the various versions of the BIP! NDR dataset,¹¹ which is a dataset providing citation links included in Computer Science (CS) conference or workshop publications that do not have a DOI. In CS, conference and workshop papers serve as important contributions, carrying substantial weight in research assessment processes, compared to other disciplines. However, a considerable number of these papers are not assigned a DOI, hence their citations are not reported in widely used citation datasets like OpenCitations and Crossref, raising limitations to citation analysis in CS. BIP! NDR aims to alleviate this issue and enhance the research assessment processes within the field of CS leveraging a workflow that identifies and

¹⁰ Beltagy Iz, Lo Kyle, Cohan Arman: SciBERT: A Pretrained Language Model for Scientific Text. EMNLP-IJCNLP 2019, 10.18653/v1/d19-1371

¹¹ BIP! NoDoiRefs (NDR) Dataset: <https://zenodo.org/doi/10.5281/zenodo.7962019>

retrieves CS papers lacking DOIs from the DBLP¹² Corpus, and by performing text analysis, it extracts citation information directly from their full text.

Implementation: The BIP! NDR Workflow has been implemented from scratch in the context of the GraspOS project. It was a result of the gap identified by the CS pilot. It is planned to be bundled with the BIP! Citation Classifier and/or the Semantic Citation Classifier to provide hints on the citation intent inside the BIP! NDR dataset.

4.2.3. BIP! Ranker

Scope & Main Functionalities: BIP! Ranker is a software library implemented in Apache Spark¹³ that computes a set of citation-based impact indicators for research products leveraging the contents of scholarly knowledge graphs. It currently supports three main categories of indicators based on the semantics of the impact aspect captured:

- “Influence” indicators, which reflect the “total” impact of each research product, i.e., how established it is in general
- “Popularity” indicators, which reflect the “current” impact of each research product, i.e., how popular it is currently
- “Impulse” indicators, which reflect the initial momentum that the research product received right after its publication

Multiple indicators are supported in each category¹⁴. For each indicator, in addition to the respective indicator value (e.g., the number of citations for Citation Count), BIP! Ranker also provides the percentile ranking of the respective product (e.g., “top 1%”), both in general and within the related scientific fields.

The tool can be executed not only locally on a typical computer but also on a computational cluster. The end user gives a citation network as input, and BIP! Ranker then calculates all scores based on the requested indicators. The Spark-based implementation is highly scalable, enabling its use even for very large citation networks consisting of billions of citation links.

Implementation: The tool is already in a mature state and has been in production for several years, providing impact-based indicators for various open datasets and APIs available through BIP! Services and the OpenAIRE Graph. As part of the GraspOS project, BIP! Ranker is planned to be extended to calculate variations of the already implemented indicators, especially those based on the identified GraspOS pilots needs (e.g., field-weighted or citation-intent-weighted

¹² DBLP: <https://dblp.uni-trier.de/>

¹³ Apache Spark: <https://spark.apache.org/>

¹⁴ Full list: https://bip.imsi.athenarc.gr/site/indicators#Article-level_Indicators

versions). The possibility of bundling it with other tools (e.g., the BIP! Citation Classifier or the Semantic Citation Classifier) will be investigated at a small scale, rather than across the full citation network. These extensions are expected to be completed by the end of the project.

4.2.4. BIP! Scholar Indicators Calculator

Scope & Main Functionalities: This software package contains implementations required for the calculation of the researcher-level indicators (mostly related to citation-based impact) that are being used by the BIP! Scholar service (see Section 5.2.5). In most cases, the author-level indicators are aggregations based on research-product-level citation indicators, like those calculated by BIP! Ranker.

Implementation: The tool existed before the start of the project. However, in the context of the project, it is expected to be extended with additional researcher-level indicators focusing on indicators that capture aspects related to Open Science (considering input from WP2 regarding relevant indicator toolboxes) and on the needs of the project pilots.

4.2.5. Metrics

Scope & Main Functionalities: OPERAS Metrics collects usage and impact metrics related to published Open Access (OA) books and allows their access, display and analysis from a single access point. By showing the impact of open access books, it also contributes to reinforcing Open Science practices. The key features are the following:

- *Comprehensive Data Collection:* usage metrics from various sources, providing a clear picture of open access book impact.
- *Open Source and Community-Driven:* based on open-source principles, offering an alternative to proprietary usage metrics services and emphasising community involvement.
- *Transparent Processing:* individual metrics come with explanations of the data source and collection methods.
- *Centrally-Managed Database and Widget:* the metrics are stored in a central database while the display is via widget on the customer's site, facilitating real-time interaction and analysis.
- *Flexible Hosting Options:* there is also the option for customers to host the service themselves, with dedicated support by Open Book Publishers.

The software is designed to collect metrics from various sources and is divided into different parts, with the most prominent being the Metrics-drivers-wrapper. These drivers serve as

entry point components, responsible for gathering data for the system. In addition, there are the 'plugins', which are used to normalise the collected data. Finally, the metrics are combined with the altmetrics and sent to the user interface, where they are displayed with a user-friendly Javascript widget.

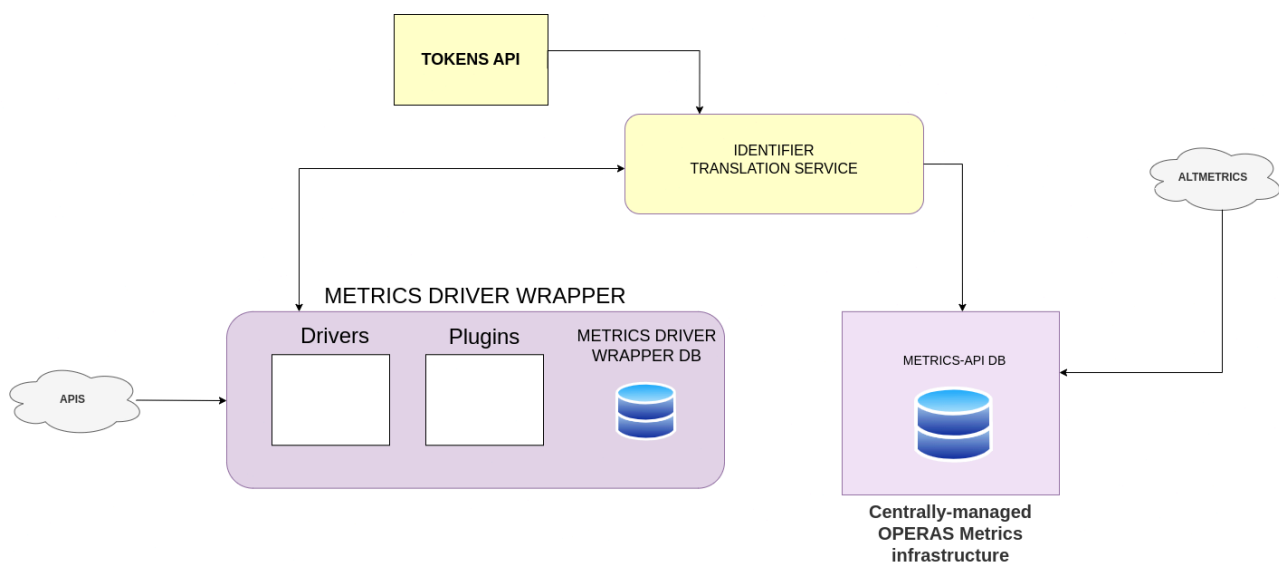


Figure 2 Simplified OPERAS Metrics Diagram (Image taken directly from: <https://metrics.operas-eu.org/docs/getting-started>)

For any interested parties, the primary steps include downloading and installing the Identifier Translation Service, and completing the Altmetrics Registration (both available on Zenodo):

- Identifier Translation Service: The Identifier Translation Service is a JSON REST API to a database of publication URIs.¹⁵ This service maps publications to URIs to enable converting from one identifier to another (e.g. info:doi:10.11647/obp.0001, urn:isbn:9781906924010, <https://www.openbookpublishers.com/product/3>).
- Altmetrics Registration: This software may be useful to individuals who have set up an Identifier Translation Service to run any of the usage metrics drivers documented in <https://metrics.operas-eu.org/docs/getting-started>.

Implementation: The tool has been operational for a number of years and has been adopted by publishers, e.g. Open Book Publishers, Ubiquity Press. Most of its key features, which relate to monitoring the use and impact of OA books, are functional and operational. The main motivation for including Metrics in the GraspOS project was to highlight and value the

¹⁵ https://github.com/hirmeos/identifiers_db

contribution of OA books in the scholarly landscape. Not many tools offer this monitoring solution and therefore Metrics could be a useful addition for any interested institution to assist their researchers in tracking and reporting on the usage/impact of their OA content. We are aware that this is a priority for SSH researchers in particular, given the dominance of the monograph as an output in the field. For GraspOS in particular, the metrics tool will be reviewed and evaluated through a public training session, and at the same time we will complete and publish documentation as part of the project to support the installation of the tool. Should we receive feedback and suggestions on how to improve the tool, these will be taken into account and reviewed as part of the project.

4.2.6. OpenAIRE IIS Text Mining Modules

Scope & Main Functionalities: This information inference tool enriches Scientific Knowledge Graphs (SKGs) with automatically inferred metadata, new entities and relations, and information from several data sources (Publication and Data Repositories, Zenodo, CODA and other trusted data providers), utilising a flexible big data processing pipeline that supports full-text and metadata mining. The goal of OpenAIRE is to provide an infrastructure for gathering, processing (including de-duplication), and providing unified access to research-related data (papers, datasets, researchers, projects, etc.). The goal of OpenAIRE IIS (Information Inference Service) is to provide data/text mining functionality for the OpenAIRE system. In practice, IIS defines data processing workflows that connect various modules, each one with well-defined input and output. A high-level overview of IIS can be found in the respective publication.¹⁶ IIS ingests data from the aggregated data sources in the OpenAIRE Graph¹⁷, runs processing workflows, and produces inferred data which, in turn, is ingested by the Information Space. Current modules include citation extraction (article-data, article-software, product-grant, product-organisations), subject inference and community context.

Implementation: The tool existed before the start of the project and is at a mature technology readiness level. As part of the GraspOS project, it is expected to be maintained and potentially bundled with other tools according to the needs of the pilots. Moreover, the pilots exploiting the OpenAIRE CONNECT Gateway have this functionality in the back-end to aggregate the data which they may use to exploit indicators for their research assessment purposes. Extension in the context of GraspOS includes methods for the completeness of metadata (e.g., resource types, subjects, licensing typology).

¹⁶ "Information Inference in Scholarly Communication Infrastructures: The OpenAIREplus Project Experience", *Procedia Computer Science*, vol. 38, 2014, 92-99

¹⁷ <https://graph.openaire.eu/docs/graph-production-workflow/aggregation/>

4.2.7. Semantic Citation Classifier

Scope & Main Functionalities: A tool that performs the automatic annotation of in-text citations in academic papers provided in PDF format. It operates through two steps, described as follows:

1. *PDF Parsing:* The tool analyses the PDF paper provided as input and extracts its basic bibliographic metadata (mainly the authors and the title), all bibliographic references with their metadata (authors, year of publication, title, venue, identifiers) marked up, the citation sentences that contain in-text reference pointers (i.e., the textual device used to refer to bibliographic references such as “[3]” and “(Doe et al., 2023)”), and other structural information, such as sections, when possible. All these data are returned in JSON format and will be produced in the next release of the tool as an RDF dataset compliant with the OpenCitations Data Model (OCDM, <https://opencitations.net/model>) (Daquino *et al.*, 2020).

2. *Citation Function Classification:* This step uses a combination of technologies, including Large Language Models (LLM) and Knowledge Graph Embeddings (KGE), to classify the semantics of each citation sentence in the JSON output generated during the parsing step. The citation functions returned by the software are a subset of those defined in the Citation Typing Ontology (CiTO, <http://purl.org/spar/cito>) (Peroni & Shotton, 2012). The output of this step is the original JSON dataset, now enriched with the specification of citation functions associated with each citation.

Implementation: This tool has been developed from scratch to meet the needs of the GraspOS project.

4.2.8. SOFTWARE-Sync

Scope & Main Functionalities: Recently, software citations have been recognised as important for research assessment processes.¹⁸ To date, there is only one international repository with a long-term preservation objective: Software Heritage. However, this repository does not allow for the identification of the contribution type of authors to the code. The extraction of software mentions from publications can help identify who created a source code, who used it and who shared it. This is why INRIA developed a tool allowing the analysis of research publications available in an Open Science repository and to scan them for software mentions. Software mentions in publications can also help correlate a source code with a specific public institution, a specific research laboratory, or authors. Therefore, their analysis can help use open data to evaluate software activity of research entities. The technical base for this work

¹⁸ <https://op.europa.eu/en/publication-detail/-/publication/b69944d4-01f3-11ea-8c1f-01aa75ed71a1>

are the open source Grobid PDF analysis program and the Softcite mentions tool. On this basis, we build a synchronisation tool (SOFTWARE-Sync) that computes Grobid¹⁹ and Softcite output together with metadata coming from the publication repository. We intend to develop a fit-for-purpose tool that will analyse PDF and metadata input from open science repositories and deliver exploitable data for a visualisation tool.

Implementation: SOFTWARE-Sync has been implemented from scratch in the context of the GraspOS project. It was a result of the gap identified by the CS pilot.

4.2.9. SOFTWARE-Vis

Scope & Main functionalities: This is a basic visualisation tool that proposes different views of software mentions, relating them to publications, authors, research teams and institutions. It is built on top of SOFTWARE-Sync.

Implementation: SOFTWARE-Vis has been implemented from scratch in the context of the GraspOS project. It was a result of the gap identified by the CS pilot.

4.3. Code Repositories and Documentation

Table 4 outlines the code repositories and documentation resources available for the array of tools currently available by the GraspOS infrastructure.

Table 4 Code repositories and documentation of the GraspOS tools

Tool name	Code repository	Documentation
BIP! Citation Classifier	https://github.com/athenarc/bip-citation-classifier	https://github.com/athenarc/bip-citation-classifier#readme
BIP! NDR workflow	https://github.com/athenarc/bip-ndr-workflow	https://github.com/athenarc/bip-ndr-workflow#readme
BIP! Ranker	https://github.com/athenarc/Bip-Ranker	https://github.com/athenarc/Bip-Ranker#readme
BIP! Scholar Indicators Calculator	https://github.com/athenarc/bip-scholar-indicators	https://github.com/athenarc/bip-scholar-indicators#readme
OPERAS Metrics	https://github.com/hirmeos	https://metrics.operas-eu.org/docs/getting-started

¹⁹ Grobid: <https://github.com/kermitt2/grobid>

OpenAIRE IIS Text Mining modules	https://github.com/openaire/iis	https://github.com/openaire/iis#readme
Semantic Citation Classifier	https://github.com/opencitation/s/cec	https://github.com/opencitations/cec/blob/main/README.md
SOFTware-Sync	https://github.com/Samuel-Scalbert/SOFTware-Sync	https://github.com/Samuel-Scalbert/SOFTware-Sync
SOFTware-Vis	https://github.com/Samuel-Scalbert/SOFTware-Viz	https://github.com/Samuel-Scalbert/SOFTware-Viz

5. GraspOS Services

This section offers implementation details for the various services currently hosted by the GraspOS infrastructure. In Section 5.1, we provide an overview of all services, while in Section 5.2, we elaborate on the main functionalities to be provided by each service, along with the development plan and current status. Finally, in Section 5.3, we include references to the respective code bases and documentation materials.

5.1. Overview

Table 5 provides an overview of the services currently available through the GraspOS infrastructure. For each service, the table lists the primary GraspOS partner responsible, as well as the main category under which the service is classified (refer to Section 3.2 for more details on the classification scheme). All services listed are being developed or extended as part of the GraspOS project and have an entry in the GraspOS Services Catalogue.²⁰ The services are ordered alphabetically by name in the table.

Table 5 Overview of the GraspOS services

Service name	Partner resp.	Category
Assessment Portfolios Registry	CWTS/TSV	Data services > Assessment registries
Assessment Protocols Registry	CWTS/TSV	Data services > Assessment registries
BIP! DB	ARC	Data services > Scholarly data resources

²⁰ GraspOS Services Catalogue: <https://graspos-services.athenarc.gr/home> (see also D4.2 & D4.4).

BIP! NDR	ARC	Data services > Scholarly data resources
BIP! Scholar	ARC	OS monitoring > Researchers
EOSC Accounting for Services	GRNET	OS monitoring > General
EOSC Observatory	OpenAIRE	OS monitoring > Countries
Open Science Observatory	OpenAIRE	OS monitoring > Countries
OpenAIRE Broker	OpenAIRE	Scholarly data enrichment > Missing attributes
OpenAIRE Connect	OpenAIRE	OS monitoring > Institutions
OpenAIRE Graph	OpenAIRE	Data services > Scholarly data resources
OpenAIRE Metadata Validator	OpenAIRE	Scholarly data enrichment > Indicators
OpenAIRE Monitor	OpenAIRE	OS monitoring > Institutions
OpenAIRE Researcher Profile	OpenAIRE	OS monitoring > Researchers
OpenAIRE ScholeXplorer	OpenAIRE	Data services > Scholarly data resources
OpenAIRE UsageCounts	OpenAIRE	Scholarly data enrichment > Indicators
OpenCitations Data	UniBo	Data services > Scholarly data resources
PRISM	OPERAS	Data services > Scholarly data resources

5.2. Main Functionalities and Development

In this section, we elaborate on the main functionalities offered by each of the GraspOS services, the current implementation status, and the high-level roadmap of development activities.

5.2.1. Assessment Portfolios Registry

Scope & Main Functionalities: Assessment portfolios facilitate the collection of inputs for research assessment, serving both as an account of the agreed approach and associated evidence for a given assessment event and as a shared resource for conducting the assessment and documenting the outcomes (more details on the concept can be found in D2.2²¹ "OSAF"). An assessment portfolio is a collaborative, multi-actor digital object that brings together the key information about assessment planning (e.g. the outcomes from SCOPE) and the assessment protocol (that collects information related to the design of the respective assessment event). An assessment portfolio also provides a means for collecting the contributions/outputs (evidence) to be assessed. It serves as a shared digital service for the full assessment event. After completion of the assessment, the portfolio can be archived for historical reference. After completion of the assessment event, the assessment protocol itself, separate from any privacy concerns, can be published in the Assessment Protocols Registry (see Section 5.2.2) to inform the community about the design in relation to the local context and stated purpose. The Assessment Protocols Registry serves as a community resource to inform, inspire the design of future assessment events. In the context of the project, a registry of assessment portfolios will be implemented based on a Research Activity Identifier (RAiD)²² service point. Based on this implementation, each portfolio will have a persistent identifier and a metadata record for documenting the evidentiary and descriptive contents used in an assessment event. Templates are provided for the following assessment levels of aggregation: individual, research group, research institutions, research community, and country. Although a user interface is available for administering access and compiling content (useful for small tasks), this service will be ideally implemented on a local platform via API.

Implementation: The Assessment Portfolios Registry is a new service being developed as part of the GraspOS project. It is currently under development, with a major version expected to be released by the end of the project.

²¹ GraspOS Deliverable 2.2: <https://zenodo.org/doi/10.5281/zenodo.10475459>

²² RAiD: <https://raid.org/>

5.2.2. Assessment Protocols Registry

Scope & Main Functionalities: The Assessment Protocols Registry is designed to register and publish assessment protocols after the completion of an assessment event. These registered protocols would ideally include documentation of the values, purpose and contextual factors related to the assessment, as well as the data sources and indicators used in the assessment. Individual identities and specific evidence used in the assessment are not included. Publishing assessment protocols promotes transparency, reuse and mutual learning. In the context of the project, an implementation of this registry will be realised based on the RAiD service point to be used for the Assessment Portfolios Registry. While there is a user interface for administering access and compiling content (useful for small tasks), this service would be ideally implemented in a local platform via API.

Implementation: The Assessment Protocols Registry is a new service being developed as part of the GraspOS project. It is currently under development, with a mature version expected to be released by the end of the project.

5.2.3. BIP! DB

Scope & Main Functionalities: BIP! DB is a data service that offers citation-based impact indicators for more than 191 millions research products, including scientific publications, software, datasets, and more. For each research product, the service provides access to the indicators (through open APIs and datasets²³) that can be calculated by the BIP! Ranker tool, creating a citation network based on citations retrieved by the OpenAIRE Graph.

Implementation: The service was already in a mature phase when the project started. Within the context of GraspOS, basic maintenance and targeted small extensions (based on feedback from the GraspOS pilots) are anticipated as part of the implementation efforts. Also, similarly to other GraspOS data services, the API will be adapted and extended to ensure compatibility with the GraspOS data model and API specification (see D4.2).

²³ BIP! DB API & datasets: <https://bip.imsi.athenarc.gr/site/data>

5.2.4. BIP! NDR

Scope & Main functionalities: BIP! NDR leverages a workflow that identifies and retrieves Open Science papers lacking DOIs from the DBLP²⁴ Corpus, and by performing text analysis, it extracts citation information directly from their full text. In the field of Computer Science, conference and workshop papers are important contributions, carrying substantial weight in research assessment processes, compared to other disciplines. However, a considerable number of these papers are not assigned a Digital Object Identifier (DOI), hence their citations are not reported in widely used citation datasets like OpenCitations and Crossref, limiting the scope of citation analysis. BIP! NDR aims to alleviate this issue and enhance the research assessment processes within the field of Computer Science.

Implementation: BIP! NDR is a new service being developed as part of the GraspOS project. It is currently under development, with a mature version expected to be released by the end of the project. Additionally, similarly to other GraspOS data services, the API will be adapted and extended to ensure compatibility with the GraspOS data model and API specification (see D4.2).

5.2.5. BIP! Scholar

Scope & Main Functionalities: BIP! Scholar is a platform that allows researchers to create profiles representing their research activities, enrich them with contextual information, and highlight different aspects of their research careers. The main objective of the platform is to offer profiles that cover a wide range of research activities, going beyond scientific publications. The platform leverages data from scholarly knowledge graphs (OpenAIRE Graph, Crossref, OpenCitations) and ORCID²⁵ to display custom reports containing lists of contributions and a variety of indicators that capture different aspects of the researchers' performance (e.g., productivity, impact, career stage) while considering their different roles in the respective works (according to the CRediT taxonomy). The platform also supports multiple ways to present (and download) researcher profiles, offering both traditional and innovative templates (e.g., narrative CV templates) aimed at being more responsible and inclusive. Finally, BIP! Scholar profiles can be dynamically tailored by the viewer to facilitate the examination of a researcher's career according to specific topics, roles or types of activity that may be of interest.

Implementation: Within the context of GraspOS, the platform will be extended to (a) support multiple profile templates for researchers (individuals and/or teams), including

²⁴ DBLP: <https://dblp.uni-trier.de/>

²⁵ ORCID: <https://orcid.org/>

well-established templates for narrative CVs and the Openness Profile concepts being developed by GraspOS experts, (b) provide more evidence on researchers' Open Science practices, and (c) offer appropriate visualisations. Profile templates have already been implemented in beta, with all features expected to be ready by the end of the project. BIP! Scholar will also be extended to be integrated with the Assessment Portfolios service.

5.2.6. EOSC Accounting for Services

Scope & Main Functionalities: EOSC Accounting for Services²⁶ is a platform designed to efficiently collect, aggregate, and exchange metrics across various infrastructures, providers, and projects. The system provides a REST API, which accepts input from diverse resources, stores it in a database, and aggregates the incoming data. It also offers an intuitive user interface that allows clients to interact with the platform and access accounting data for specific time periods. All API resources are accessible only to authenticated clients, ensuring secure access to sensitive data.

The key functionalities offered by the EOSC Accounting Service include:

- Efficient collection, aggregation, and exchange of metrics
- REST API for input from diverse resources
- Database storage and aggregation of incoming data
- Intuitive user interface for accessing accounting data
- Secure access to sensitive data through authenticated clients.

The system provides a framework for organising and managing accounting data for specific projects, providers, or installations. It involves various roles, such as Project Admin, Provider Admin, and Installation Admin, each with a specific set of responsibilities.

One of the core components of the Accounting Service is Metrics, which are quantitative measures used to evaluate and monitor the performance or usage of a service. A Metric Definition specifies the type of metric being tracked. In this system, Metric and Unit Types are crucial for collecting and monitoring various metrics. A Metric Type determines how physical quantities are gathered over time, while a Unit Type defines and measures these quantities across different infrastructures, service providers, and projects. This framework enables users to collect and analyse data at various levels of detail and in different units of measurement.

This system could be extended in order to compute open science-related impact metrics, harvested from infrastructures' usage statistics. For instance, it could be applied to track the number of users, and projects, helping to demonstrate how resources support broader

²⁶ <https://accounting.eosc-portal.eu> and <https://argoeu.github.io/argo-accounting>

collaboration by counting the researchers or institutions utilising the infrastructure, or to capture the geographical distribution of these users, illustrating the global reach and inclusivity of Open Science initiatives. Additionally, by measuring data transfer rates, the system could highlight the extent of data sharing and collaboration across different resources, services, and platforms, reflecting the project's contribution to Open Science.

Implementation: Within the context of GraspOS, GRNET will investigate the possibility of adding support for a more complex type of metrics that may be used to capture impact insights. This would enable stakeholders to easily access and analyse comprehensive data on the effectiveness of Open Science initiatives.

5.2.7. GoTriple Discovery Platform

Scope & Main Functionalities: GoTriple is a multilingual platform tailored for the in-depth exploration of Social Sciences and Humanities (SSH) research. It facilitates the discovery of scholarly content and fosters academic collaboration. From a single access point, researchers can find publications, research profiles and projects which are currently scattered across local repositories. The key features are the following:

- **Specific Search Engine for Social Sciences and Humanities:** search capabilities specifically for the SSH community.
- **Multilingual Research Access:** support for multiple languages, allowing to find publications, engage with and contribute to international research dialogues.
- **Open Access Emphasis:** a wealth of Open Access resources, reflecting a commitment to the principles of Open Science.
- **Visual Data Interpretation:** availability of tools to facilitate the understanding of complex academic information.
- **Intuitive Interface Design:** straightforward and accessible design, allowing to easily focus on the research.
- **Community and Collaboration:** a path to strengthen connections within the SSH disciplines, promoting community-driven research and collaboration.

Implementation: The service has been active for several years. Its inclusion in GraspOS is aimed at the use of APIs to be embedded in the GraspOS infrastructure to allow interested parties to explore the diversity of resources found in the SSH domain. The advantage of GoTriple as a data source is that it aggregates metadata from multiple sources, which should

save time and effort for any potential user of the APIs. Further evaluation of the potential use and exploitation of the APIs will be undertaken as part of any research evaluation process.

5.2.8. Open Science Observatory

Scope & Main Functionalities: The Open Science Observatory²⁷ is a portal designed to facilitate access to Open Science indicators for policymakers, funders and other organisations by combining and visualising information from all over Europe. It presents a collection of indicators and visualisations that help stakeholders better understand the Open Science landscape in Europe across countries and subject areas. The platform assists in the monitoring and consequently enhancing Open Science policy uptake across various dimensions of interest, identifying weak spots and uncovering hidden potential. Based on the OpenAIRE Graph, following Open Science principles and an evidence-based approach, the indicators provide timely and reliable insights into the evolution of Open Science in Europe, and assist in promotion of good practices.

Implementation: The service was already in a mature phase when the project started. In the context of GraspOS, basic maintenance and targeted small extensions (based on feedback from the GraspOS pilots), are planned. This service enables pilots and GraspOS CoP to visualise the impact of their OS policy and/or the curation and implementation of scholarly metadata whether the pilots register national or institutional data sources such as CRIS or repositories in OpenAIRE PROVIDE. Thus, users can benefit from analysis and statistics in comparison with time and other countries. This tool connects with the EOSC observatory, offering a link with EOSC Track²⁸.

5.2.9. OpenAIRE Broker

Scope & Main Functionalities. The OpenAIRE Broker is a notification service that enables content providers (such as repositories, CRIS systems, aggregators, knowledge graphs, and publishers) to complete and enrich the metadata of their registered scholarly works with information from the OpenAIRE Graph. This service effectively enhances the provider's content with up-to-date information that may be missing, thereby showcasing the openness, FAIRness, usage, and links to other records. The service is available to the end users through a registration to the OpenAIRE PROVIDE²⁹ service.

²⁷ Open Science Observatory (OSO), <https://osobservatory.openaire.eu>

²⁸ EOSC Track: <https://www.openaire.eu/eosc-track-project>

²⁹ OpenAIRE PROVIDE: <https://provide.openaire.eu/home>

Implementation: Within the context of GraspOS, we plan to extend the current data model to cover additional research results, relationships between products, classifications, and other metrics included in metadata records. Special focus will be given on requests related to the GraspOS pilots.

5.2.10. OpenAIRE CONNECT

Scope & Main Functionalities: OpenAIRE CONNECT is a service providing a research gateway for research initiatives, research infrastructures, research communities and networks that jointly would like to showcase their Open Science activities. These customised, on-demand gateways offer a sustainable platform for discovering, sharing, and curating research products (publication, data, software and other). Curators can customise the dashboards to their preferences, filtering and selecting information from the OpenAIRE Graph.

Implementation: The service was already in a mature phase when the project started. In the context of GraspOS, basic maintenance and targeted small extensions (based on feedback from the GraspOS pilots) are anticipated as part of the implementation efforts. OpenAIRE CONNECT enables users to build thematic monitors or customised APIs on scholarly research publications, data, software or other research products based on their own specific criteria. This will be mainly exploited by thematic pilots.

5.2.11. OpenAIRE Graph

Scope & Main Functionalities: The OpenAIRE Graph is a free and open resource that brings together and interlinks hundreds of millions of metadata records from over 100k trusted data sources. Launched in 2012 as one of the first research knowledge graphs, it has since grown into one of the world's largest and most authoritative sources for the European Open Science Cloud (EOSC). The Graph is accessible to researchers, communities, institutions, companies, and citizens, enabling them to access research products and related information.

Implementation: The service was already in a mature phase when the project started. In the context of GraspOS, basic maintenance and targeted small extensions (based on feedback from the GraspOS pilots) are anticipated as part of the implementation efforts. Also, similarly to other GraspOS data services, the API will be adapted and extended to ensure compatibility with the GraspOS data model and API specification (see D4.2).

5.2.12. OpenAIRE Metadata Validator

Scope & Main Functionalities: The OpenAIRE Validator service is designed for content providers who wish to register their content with OpenAIRE. It allows them to verify that their content complies with the OpenAIRE guidelines and checks the quality of implementation of the OAI-PMH protocol³⁰. Content providers can access the service after logging into OpenAIRE PROVIDE. The provider's content will be regularly aggregated to contribute to the OpenAIRE Graph. OpenAIRE allows for the registration of institutional and thematic repositories registered in OpenDOAR³¹, research data repositories registered in re3data³², individual e-Journals, CRIS registered in euroCRIS DRIS³³, aggregators and publishers. The OpenAIRE Validator service is implemented with configurable software that allows users with administrative rights to customise the validation options such as the version of the OpenAIRE Guidelines to validate the content and the number of records or specific sets to be validated. This feature makes it easier to adapt the service when the OpenAIRE guidelines or the Metadata Validator service are updated and to offer similar services, possibly with different rules and configurations. The service is available to the end users through a registration to the OpenAIRE PROVIDE³⁴ service.

Implementation: The service was already in a mature phase when the project started. Within the context of GraspOS, we plan to extend the OpenAIRE Validator service with configurations for custom and domain-specific FAIRness metrics at the level of metadata records and average-based metrics for data sources, funders, and institutions.

5.2.13. OpenAIRE MONITOR

Scope & Main Functionalities: OpenAIRE MONITOR is a service that generates well-documented, timely, and accurate monitoring indicators of research activities for funders, research initiatives, and organisations, by creating personalised, on-demand, and configurable online dashboards. All information is aggregated, processed, and provided by the OpenAIRE Graph. The OpenAIRE MONITOR aims to create a comprehensive and relevant set of metrics, as well as composite and advanced indicators to build funder, institutional and research infrastructure monitoring dashboards. It offers functionalities such as external

³⁰ OAI-PMH protocol: <https://www.openarchives.org/pmh/>

³¹ <https://v2.sherpa.ac.uk/opensoar/>

³² <https://www.re3data.org/>

³³ <https://eurocris.org/services/driscris/>

³⁴ OpenAIRE PROVIDE: <https://provide.openaire.eu/home>

(public stakeholders) vs internal (team members) dashboards, downloading visualisations and datasets, filtering functionalities and links to actual research outputs, with the aim of being a one-stop shop for the monitoring, policymaking, analysis and reporting needs of stakeholders.

Implementation: The service was already in a mature phase when the project started. Within the context of GraspOS, the OpenAIRE MONITOR is planned to be extended with additional indicators. The existing administration backend will be enhanced with pre-set templates, and support will be provided for building additional templates tailored to specific needs.

5.2.14. OpenAIRE Researcher Profile

Scope & Main Functionalities: OpenAIRE Researcher Profile is a new service being developed as part of the GraspOS project. It will be a comprehensive platform designed to showcase a researcher's academic and entrepreneurial portfolio. This profile not only displays traditional research products such as publications, data, and software but also highlights the researcher's broader academic activities and entrepreneurial endeavours to create a personalised and updated career pathway.

In addition to a detailed overview of their contributions, the profile features statistics and indicators offering valuable insights of researchers' aggregated impact, productivity, and compliance with OS practices. OpenAIRE Researcher Profile aims to help researchers increase their visibility, track their performance, and demonstrate their adherence to OS principles.

Implementation: The OpenAIRE Researcher Profile is a new service being developed as part of the GraspOS project. It is currently under development, and a mature version of the service is expected to be released by the end of the project.

5.2.15. OpenAIRE ScholeXplorer

Scope & Main Functionalities: ScholeXplorer is a service that provides access to the largest collection of Open Access citations between articles and datasets and between datasets themselves, as exposed by Crossref³⁵, DataCite³⁶, EMBL-EBI³⁷, and OpenAIRE³⁸. Links (and objects) are provided by data sources managed by publishers, data centres, or other organisations providing services to store and manage links between data sets and publications. ScholeXplorer aggregates link metadata harvested from the data sources and

³⁵ <https://www.crossref.org/>

³⁶ <https://datacite.org/>

³⁷ <https://www.ebi.ac.uk/ebisearch/about>

³⁸ <https://explore.openaire.eu/>

out of these, it builds harmonised and de-duplicated graphs of scholarly objects. The graph is openly accessible via search REST APIs that return links in Scholix format.

Implementation: The service was already in a mature phase when the project started. In the context of GraspOS, basic maintenance and targeted small extensions (based on feedback from the GraspOS pilots) are anticipated as part of the implementation efforts. Additionally, similarly to other GraspOS data services, the API will be adapted and extended to ensure compatibility with the GraspOS data model and API specification (see D4.2).

5.2.16. OpenAIRE UsageCounts

Scope & Main Functionalities: The UsageCounts service collects usage data from Open Science content providers, repositories, journals, and other scientific data sources. Then, it aggregates them, delivering standardised activity reports on research usage and uptake. This service complements existing citation mechanisms and assists institutional repository managers, research communities, research organisations, funders, and policymakers in tracking and evaluating research from an early stage.

Implementation: The service was already in a mature phase when the project started. In the context of GraspOS, basic maintenance and targeted small extensions (based on feedback from the GraspOS pilots) are anticipated as part of the implementation efforts.

5.2.17. OpenCitations Data

Scope & Main Functionalities. OpenCitations has been established as a fully free and open infrastructure to provide access to global scholarly bibliographic and citation data. It enables several key benefits:

- Fairness: OpenCitations avoids the need for institutions and independent scholars to pay exorbitant fees annually (that most of them cannot afford) for commercial access to their own scholarly data, making access more equitable
- Reuse: Since there are no licence restrictions, and all data are provided under CC0, users can republish and reuse the citation data for any purpose.
- Research assessment: OpenCitations provides open data that can be used in national and international research evaluation exercises, making these activities transparent and reproducible.
- Governance: The community is directly involved in the evolution of the infrastructure, ensuring that it meets the needs of its users.

Implementation: The service was already in a mature phase when the project started. In the context of GraspOS, basic maintenance and targeted small extensions (based on feedback from the GraspOS pilots) are anticipated as part of the implementation efforts. In particular, after discussing with some project partners we have added an additional operation to the OpenCitations Index API (<https://w3id.org/oc/index/api/v2>) named “venue-citation-count” which enables one to retrieve the number of incoming citations to all the bibliographic entities published into a specific journal identified by ISSN. Also, recently we have revised the ingestion workflow (described in https://doi.org/10.1162/qss_a_00292 and <https://doi.org/10.48550/arXiv.2408.02321>), and we have ingested new citation data from Crossref resulting in having more than 2 billion citations in our collections. Finally, similarly to other GraspOS data services, the API will be adapted and extended to achieve compatibility with the GraspOS data model and API specification (see D4.2).

5.2.18. PRISM

Scope & Main Functionalities: The Peer Review Information Service for Monographs (PRISM) gives publishers the opportunity to display information about their peer review procedures in a standardised way and enables inclusion of this information as part of the book’s metadata in the Directory of Open Access Books (DOAB). PRISM contributes to building trust in Open Access book publishing by improving transparency around the quality assurance process. The key features are the following:

- *Title-Level Detail:* provision of specific information about the peer review process applied to each publication, directly on the DOAB platform.
- *Controlled Vocabulary:* standardised set of terms to describe their peer review processes, promoting consistency and clarity.
- *Catalogue-Level Overview:* showcase of transparency across a publisher’s catalogue, showing the peer review processes that their titles undergo.
- *API Integration:* data accessibility through the DOAB API, allowing for easy inclusion in library databases and search tools.

Implementation: PRISM is also available and operational as part of EOSC. Its inclusion in GraspOS is related to the valorisation of peer review practices in the expanding criteria and processes related to RRA. Similar to OPERAS Metrics, PRISM supports the inclusion of Open Access books in research assessment processes by increasing the transparency of the quality assurance process behind their publication. The role of PRISM in this project is twofold: 1) publishers (of all types) can initiate a process to use the PRISM service through DOAB; 2) as a development commitment, OPERAS will create a subset of records containing the metadata of

all articles in DOAB that contain a PRISM record and make the record available in Zenodo. This will be updated periodically through data dumps once or twice a year. This will be updated periodically through data dumps once or twice a year. Also, similarly to other GraspOS data services, the API will be adapted and extended to achieve compatibility with the GraspOS data model and API specification (see D4.2).

5.3. Code Repositories and Documentation

Table 6 outlines the code repositories, the demonstrators (if any), and the documentation resources available for the array of services that are currently available by the GraspOS infrastructure.

Table 6 Code repositories and documentation of the GraspOS services

Component	Code repository	Current deployment	Documentation
Assessment Portfolios Registry	N/A	N/A	N/A
Assessment Protocols Registry	N/A	N/A	N/A
BIP! DB	https://github.com/athenarc/Bip-Ranker	https://bip-api.imsi.athenarc.gr/documentation	https://github.com/athenarc/Bip-Ranker/blob/main/README.md
BIP! NDR	https://github.com/athenarc/bip-ndr-workflow	N/A	https://github.com/athenarc/bip-ndr-workflow/blob/main/README.md
BIP! Scholar	Implementation of indicators: https://github.com/athenarc/bip-scholar-indicators Front-end is part of the BIP! Services code: https://github.com/athenarc/bip-services	https://bip.imsi.athenarc.gr/scholar	https://bip.imsi.athenarc.gr/site/indicators#Researcher-level_Indicators
EOSC Accounting for Services	https://github.com/ARGOeu/argo-accounting	https://acc.devel.argo.gr/net.gr/	https://argo.eu.github.io/argo-accounting/

GoTriple Discovery Platform	N/A	https://www.gotriple.eu	https://zenodo.org/records/7371832
Open Science Observatory	N/A	https://osobservatory.openaire.eu/home	N/A
OpenAIRE Broker	https://code-repo.d4science.org/D-Net/dnet-hadoop https://code-repo.d4science.org/D-Net/dnet-applications https://github.com/openaire/broker-commandline-client	https://provide.openaire.eu (part of the OpenAIRE PROVIDE)	https://graph.openaire.eu/develop/broker.html https://api.openaire.eu/broker/swagger-ui/index.html
OpenAIRE Connect	https://code-repo.d4science.org/MaDgIK/connect	https://connect.openaire.eu/	https://connect.openaire.eu/about/learn-how
OpenAIRE Graph	https://code-repo.d4science.org/D-Net/dnet-hadoop	https://graph.openaire.eu/	https://graph.openaire.eu/docs/
OpenAIRE Metadata Validator	https://code-repo.d4science.org/MaDgIK/metadata-validator-ui https://code-repo.d4science.org/MaDgIK/uoa-validator-api https://code-repo.d4science.org/MaDgIK/validator-engine	http://duffy.di.uoa.gr:5100/	Not available yet It is a tool built and based on the OpenAIRE Guidelines http://guidelines.openaire.eu/en/latest/
OpenAIRE Monitor	https://code-repo.d4science.org/MaDgIK/monitor https://code-repo.d4science.org/MaDgIK/monitor-dashboard	https://monitor.openaire.eu/	https://monitor.openaire.eu/about https://monitor.openaire.eu/methodology/methodological-approach https://monitor.openaire.eu/methodology/terminology

			<p>minology</p> <p>https://monitor.openaire.eu/indicators/themes</p> <p>https://catalogue.openaire.eu/service/openaire_funder_dashboard/overview</p>
OpenAIRE Researcher Profile	N/A	N/A	N/A
OpenAIRE ScholeXplorer	https://code-repo.d4science.org/D-Net/dnet-applications/src/branch/master/apps/scholexplorer-api	https://scholexplorer.openaire.eu/	https://scholexplorer.openaire.eu/documentation
OpenAIRE UsageCounts	https://code-repo.d4science.org/MaDgIK/usage-counts	Incorporated into OpenAIRE PROVIDE	https://usagecounts.openaire.eu/
OpenCitations Data	All repository containing software used to run the infrastructure and ingest citation data can be found at https://github.com/opencitations/	https://opencitations.net	<p>Data: https://opencitations.net/download</p> <p>API:</p> <ul style="list-style-type: none"> OpenCitations Index: https://w3id.org/oc/index/api/v2 OpenCitations Meta: https://w3id.org/meta/api/v1
PRISM	If you want to display PRISM information on your own website, you can deploy the PRISM widget. The documentation can be found here:	Metadata extraction through this link. Supports isolating books with PRISM record: https://www.doabooks.org/en/librarians/meta	Generic documentation on how a publisher can join DOAB/PRISM: https://doabooks.org/en/publishers/documentation

	https://github.com/trilobiet/prism-widget .	data-harvesting-and-content-dissemination	
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6. Conclusions

The GraspOS project aims to enhance research assessment processes by integrating responsible practices and Open Science principles. To realise this aim, offering a comprehensive suite of tools and services to address various challenges in research evaluation is of utmost importance. These tools and services should assist evaluators with their everyday routines and should be able to help with ensuring transparency, inclusivity, consideration of diverse outputs and activities, and the incorporation of Open Science practices in conducting research assessment. GraspOS aims to deliver a robust federated infrastructure that makes such tools and services easily discoverable.

In this report, we outlined the main functionalities of the current array of GraspOS tools and services and provided details on their implementation. The detailed exploration of the current set offers an initial glimpse into their potential impact on research assessment practices. As the project progresses, the continuous enhancement and expansion of these resources will further contribute to the evolution of OS-aware RRA, ultimately benefiting the broader research community.