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UKRI GAP ANALYSIS OF OPEN ACCESS MONOGRAPHS INFRASTRUCTURE

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Open Access Publishing in European Networks

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1. EXECUTIVE SUMMARY

1.1 BACKGROUND

In October 2020, UK Research and Innovation (UKRI) commissioned OAPEN to carry out a gap analysis of technical infrastructure for open access monographs, edited works and book chapters. This report presents the results of the gap analysis. It aims to inform UKRI on infrastructure requirements for OA monographs as part of its considerations for introducing an OA policy for monographs. The report describes high-level workflows and the following stakeholders: author; publisher; (research) institution; funder. The report uses a granular classification of the technical infrastructure supporting OA books and chapters.

The scope of the report is to identify infrastructure that either handles open access books exclusively, to a large extent, and/or is key infrastructure for OA books. The focus of this project is on shared technical infrastructure to support OA book publishing for all stakeholders, including all types of publishers and business models.

1.2 USE CASES, WORKFLOW AND INFRASTRUCTURE

The report describes use cases and workflows as a form of information transfer: for sharing both research results and metadata. The following use cases are identified in the report: publish research findings (author); build and manage academic profile; publish research findings (publisher); run repository/library; manage research (institution); manage research (funder); promote open access.

The infrastructure is classified into the following areas: publication infrastructure, quality assurance, compliance checking, hosting and delivery, discovery, preservation, monitoring and measuring impact, open access engagement; and advocacy.

The infrastructure is used by all stakeholders to perform interconnected tasks. The infrastructure connections consist of metadata about objects such as the manuscript or the research grant. By focusing on the tasks shared by different stakeholders, overlapping interests are revealed. This helps identify gaps in the existing infrastructure.

1.3 GAP ANALYSIS AND RECOMMENDATIONS

The identified gaps occur in most infrastructure areas. There is perceived lack of transparency in monograph publishing, particularly in quality assurance. There should be more attention for best practice in OA book publishing. Authors need to be better supported and have the option to publish their research outputs open access, and funders and institutions need to improve infrastructure to support compliance with policies and monitor research outputs. There are shortcomings in the use of metadata and standards for OA books that limit interoperability and discovery, affecting the wider ecosystem around OA books.

The recommendations are to a large extent relevant for the broader stakeholder community and can be considered in the wider context of policy development and measures to improve the infrastructure for OA books.

Gaps and recommendations are summarised in the table below.

Table 1 Gaps and recommendations

Infrastructure area	Identified gaps	Recommended actions
OA engagement & advocacy	Lack of awareness among researchers of possibilities concerning OA book publishing. Lack of infrastructure to help authors clear third-party rights for OA publications.	Work with publishers to build case studies and success stories around OA books. Address issues of licensing, copyright, third party rights, re-usability. Support of community initiatives such as Think, Check, Submit and the OA books toolkit.
Quality assurance infrastructure	Perceived lack of quality in OA books	Promote and where appropriate require transparency. Support initiatives to improve transparency of peer review practices, such as Directory of Open Access Books (DOAB) certification Follow example of the community initiative 'Principles of transparency and best practice in scholarly publishing' for journals.
Compliance checking	Lack of tools for OA books	Initiate/contribute to efforts to support authors to understand their options: to find funding opportunities, to comply with policies. Support development of 'Books checker tool'/SHERPA for books.
Monitoring & measuring impact	Missing metadata to connect OA books to research grants and publication funds. Lack of standardisation and best practices around usage data. Lack of representation of OA books in CRIS/RIM systems.	Introduce Digital Object Identifiers (DOIs) for research and publication grants. Make use of DOI metadata schema to connect related Persistent Identifiers (PIDs). Integrate with the National Bibliographic Database (NBK) (data exchange). Support initiative to establish open book watch. Support standardisation and best practices around usage metrics.
Discovery	Lack of downstream 'coverage' of metadata, in particular PIDs and funding details. OA books metadata degradation throughout the ebook supply chain. Libraries have trouble identifying OA books (OA tagging).	Align with national stakeholders and international partners. Take part in community initiatives to achieve further standardisation and best practices around metadata. Support DOAB as registry/discovery service. Support potential follow-up project of Community-led open publication infrastructures (the COPIM project) - Open Dissemination System.
Preservation	Technical challenge of preservation and ambiguity concerning who is responsible for the preservation of OA books.	Develop approach to preservation of OA books in liaison with UK legal deposit libraries and international partners. Consider outcome of the COPIM project's work on archiving and digital preservation.
Hosting/aggregation	Self-archiving is not an established route for longform publications. Aggregation is an opportunity to improve monitoring, discovery, impact.	Evaluate self-archiving/green OA for books with stakeholders. Consider national aggregation/national platform. Work with OAPEN as aggregator for funded OA books and deposits.

Infrastructure area	Identified gaps	Recommended actions
Interoperability	Co-existing metadata formats, lack of best practices for OA books metadata and implementations of PIDs.	Require use of PIDs where possible. Support use of OA switchboard for books.
Revenue management infrastructure	(out of scope for our analysis)	Engage in innovation around OA models.

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2. INTRODUCTION

In October 2020, UKRI, commissioned OAPEN to carry out a gap analysis of technical infrastructure for OA monographs, edited works and book chapters[1]. The project is to identify the gaps in the technical infrastructure by identifying existing and planned infrastructure (including projects). This must include details of ownership, governance and resourcing, stages of the development and any other relevant information. Furthermore, the project will identify interoperability possibilities between infrastructure by suggesting metadata standardisation such as Persistent Identifiers (PIDs) and how these might be pulled together as a network of infrastructure.

The aim of this effort is to inform UKRI on infrastructure requirements for OA monographs as part of its considerations for introducing an OA policy for monographs, edited works and book chapters. It will also be used to inform implementation of, and compliance with, the OA policy from an institutional and publisher perspective. The project is being carried out by Eelco Ferwerda, Tom Mosterd, Ronald Snijder (OAPEN), and Pierre Mounier (OPERAS/OpenEdition).

2.1 OBJECTIVES AND SCOPE

The project specification provided by UKRI outlined objectives and indicated the scope regarding technical infrastructure.

The objectives of this work are to:

- Map out a high-level workflow of publishing an OA monograph, considering the perspectives of multiple stakeholders (author, research library, publisher).
- Identify existing and planned technical infrastructure, with descriptions of how these operate/interact with one another (if at all).
- Identify gaps (pain points) in the technical infrastructure.
- Identify ways in which UKRI might consider supporting existing infrastructure and how UKRI might address any gaps.
- Suggest metadata requirements for interoperability.

It is envisaged that the following technical infrastructure is in scope:

- Infrastructure to engage authors, publishers and institutions in OA for books.
- Infrastructure to support authors in finding OA publishers and understanding compliance.
- Infrastructure to support publishers in complying with funder policy and provide a variety of models for authors and institutions.
- Infrastructure to support institutions and their libraries provide support to their researchers, to provide value for money and to monitor and report on compliance to funders.
- Infrastructure for funders to monitor compliance and evaluate the success of the policy regarding the transition to OA for books.
- Europe and North American countries have projects in development. Research should not be limited to UK-based infrastructure, however the governance of these infrastructures is a consideration.

[1] The focus of this report is on long-form research publications. Textbooks are not part of the scope.

2.2 APPROACH

Our analysis is based on a literature review, specifically in the areas of OA infrastructures and OA books and chapters. We used The Knowledge Exchange reports on sustainability of open access services (Adema, 2019; Crow, 2013; Swan, 2012) as a starting point. These reports describe several use cases in terms of the services used by the research-related community in conjunction with key free-to-use services.

2.3 ANALYSIS

Although the Knowledge Exchange reports are research article orientated, they describe functions and stakeholders that also apply to OA books and chapters. Thus, the services described are re-evaluated through the lens of OA books and chapters, and the description of services has been updated to reflect the current state of affairs concerning OA books. The use cases informed the creation of high-level workflow descriptions of four stakeholders: authors, publishers, research institutions and funders. These interlocking workflows enabled identification of several key components, which informed the development of a high-level metadata model encompassing authors, publishers, publications, institutions, funders and funding. This high-level metadata model describes the information about the objects and actors that are shared between the stakeholders. Next, we developed a classification scheme for infrastructure services and compiled a first inventory of technical infrastructure, including emerging infrastructure, both general (for both books and journals) or specific (for books or journals). The focus of this report is on shared technical infrastructure to support OA book publishing for all stakeholders, including all types of publishers, and different business models.

2.4 CONSULTATION

The results of our analysis and the inventory of technical infrastructure were presented in an interim report, to enable feedback in a round of expert consultation. A subsequent version of the interim report was used for an online workshop with stakeholders, with a focus on the inventory of technical infrastructure, the identified gaps, and possible recommendations for UKRI. The results of the workshop formed the input for the final work on identified gaps and recommendations. In addition to these consultations, there were regular meetings with the project steering group, which involved presenting the findings in the interim report, the identified gaps, and the recommendations.

The steering group members were Rachel Bruce, Tahia Zaidi, Helen Snaith, Dylan Law, Graham Stone, David Prosser and Christopher Pressler.

3. HIGH-LEVEL WORKFLOWS FOR STAKEHOLDERS

By describing high-level workflows, we can abstract a complex reality into a more workable format. This also means that the actors – 'the stakeholders' – are reduced to conceptual entities. We have defined the following stakeholders: author, publisher, (research) institution; funder. The stakeholders are an abstraction of the actors described by Swan (2012). The actors do not work in silos and there is constant contact between the stakeholders. This is reflected in the tables describing the workflows in the column "Object or stakeholder to identify".

An author is defined as a person that aims to make research publicly available. A publisher is defined here as an organisation that publishes the research results in a book. This definition encompasses both for-profit and not-for-profit organisations. Furthermore, whether the book is published in formats other than a digital OA version is not relevant for this report. An institution is defined as an organisation that supports research activities. These activities include the management of libraries and/or repositories, as well as the management of research activities. A funder is defined as an organisation that financially supports research activities.

Service providers and readers are not listed as stakeholders as the main purpose of this report is to understand the needs of the actors in the publication lifecycle and identify what services are required to fulfil those needs. While service providers play an important role in the books landscape, the primary focus of this report is on the people and organisations that form the foundation of the publication lifecycle. Likewise, readers are out of scope for this report, although reading is an important part of the research and discovery process.

Organisations may play multiple roles, for example a research institution can also be a publisher, or a funder can also conduct research. However, the workflows are task-oriented and do not explicitly mention the organisation performing this task. It is also noteworthy that the stakeholders may cross different scientific and scholarly disciplines, each with their own disciplinary culture and practices. Additionally, UKRI recognises the following stakeholders: researchers and research organisations, businesses, universities, NHS bodies, charities, non-governmental organisations (NGOs) and other institutions (UKRI, 2020). For clarity, these stakeholders are simplified in the entities described.

4. TECHNICAL INFRASTRUCTURE CLASSIFICATION / INVENTORY

Starting with the work of Ficarra *et al.* (2020); Swan (2012) and Taylor (2019), we have created a more granular classification of the technical infrastructure involved with OA books and chapters. Given the fact that OA books and chapters are, by definition, digital objects, only digital infrastructure is described.

We have predominantly focused on community-led infrastructure and services, however commercial and proprietary offerings have been considered to ensure an overview of all relevant offerings. Community-led infrastructures are in line with the developments in OA book publishing and lend themselves to participation of all stakeholders, including different types of publishers. The focus on community control ensures that the infrastructure remains a trusted and reliable resource – supporting informed decision making for the community as well as providing as base for private enterprise to provide value added services (Bilder *et al.*, 2015).

Furthermore, we also looked at infrastructure and services that cater for OA journals. Using this, we have created a comprehensive overview, which will support the identification of possible gaps.

The following technical infrastructure classifications have been identified as key infrastructure areas for OA books and are in-scope of this project:

- OA engagement and advocacy.
- Publication infrastructure.
- Quality assurance infrastructure.
- Compliance checking infrastructure.
- Hosting and delivery.
- Discovery.
- Preservation.
- Monitoring and measuring of impact.

4.1 SCOPE LIMITATION

Given the open licensing of OA books and ebooks can be made available via a variety of hosting and delivery platforms, for the purpose of this project we have limited the scope to identifying infrastructure that either handles OA books exclusively or to a large extent; and/or are key infrastructure for OA books. This excludes infrastructures that can be referred to as 'infomediaries' which play an important role in the contemporary (e)book supply chain but pose challenges when it comes to incorporating OA books into their existing workflows. See Watkinson *et al.* (2017).

The project team acknowledge that there are key aspects to OA book publishing apart from technical infrastructure, such as: business models, culture and practices around monograph publishing. While important these are out of scope for this project.

The report focuses on shared, technical infrastructure to support OA book publishing for all stakeholders, including all types of publishers and business models. Furthermore, certain technical infrastructure related to OA books plays a role within the larger landscape but will not be considered as part of the scope of this project, this includes:

- Infrastructure essential and supportive of the writing process.
- Infrastructure related to research data and research data itself.
- Subscription and purchasing infrastructure for ebooks (including infomediaries).

5. USE CASES AND WORKFLOW

The use cases and workflow described here are based on Swan (2012). We have evaluated the use cases described and assessed which of these are relevant to OA books and chapters. The relevant use cases have been placed in an order which best represents the research life cycle, starting with the publication of the research outputs, followed by hosting and delivery of the research outputs, and ending with assessing the impact.

This life cycle can also be seen as a form of information transfer as data about the process is shared from one stakeholder to the next, alongside the research results. To support this process, several objects and entities must be identified. These include not just the books and chapters, but also the stakeholders themselves and the research projects underlying the studies. The identifier requirements are based on the report by Brown (2020).

The use cases described in this chapter are based on the following assumptions: the authors have received funding at the start of the workflow processes, and all publishers are compliant with the funder requirements.

We have identified the following use cases:

1. Publish research findings (author): the work done by an author to ensure that their research outputs can be published. Depositing the version of record in a repository or managing the funding for the publisher may be part of this process.
2. Build and manage academic profile: closely connected to the publication process is maintaining an academic profile, which includes listing the published results and managing the assessment data.
3. Publish research findings (publisher): the publishing process encompasses tasks centred about the book or chapter, such as metadata management, open access dissemination and preservation, and tasks involving funder compliance. The latter is a prerequisite to funding.
4. Run repository/library: organisations that manage repositories and libraries will be concerned with hosting and preservation of the research results, enhancing discovery through metadata management, and managing assessment data. From our perspective, there is no significant difference between a repository that hosts a book or chapter and a library that has OA books and chapters in their collection.
5. Manage research (institution): managing research can be divided into two main parts: managing assessment data and managing the financial aspects of funding.
6. Manage research (funder): obviously, funders are involved with funding research projects and open access as an investment and delivering on value for money for public money. However, funders have a responsibility to define principles guiding financial decisions. Furthermore, they need assessment data to evaluate the impact of their funding.
7. Promote open access: to foster OA for books and chapters, several stakeholders are involved with the development of OA policies and advocacy to authors.

The use case descriptions contain tools and services; objects or stakeholders to identify. More detail on tools and services can be found in Chapter 7, Technical infrastructure classification table. The identification of objects and stakeholders is described in Appendix 1: Identifiers grouped by type.

5.1 PUBLISH RESEARCH FINDINGS (AUTHOR)

Table 2 Publish research findings (author)

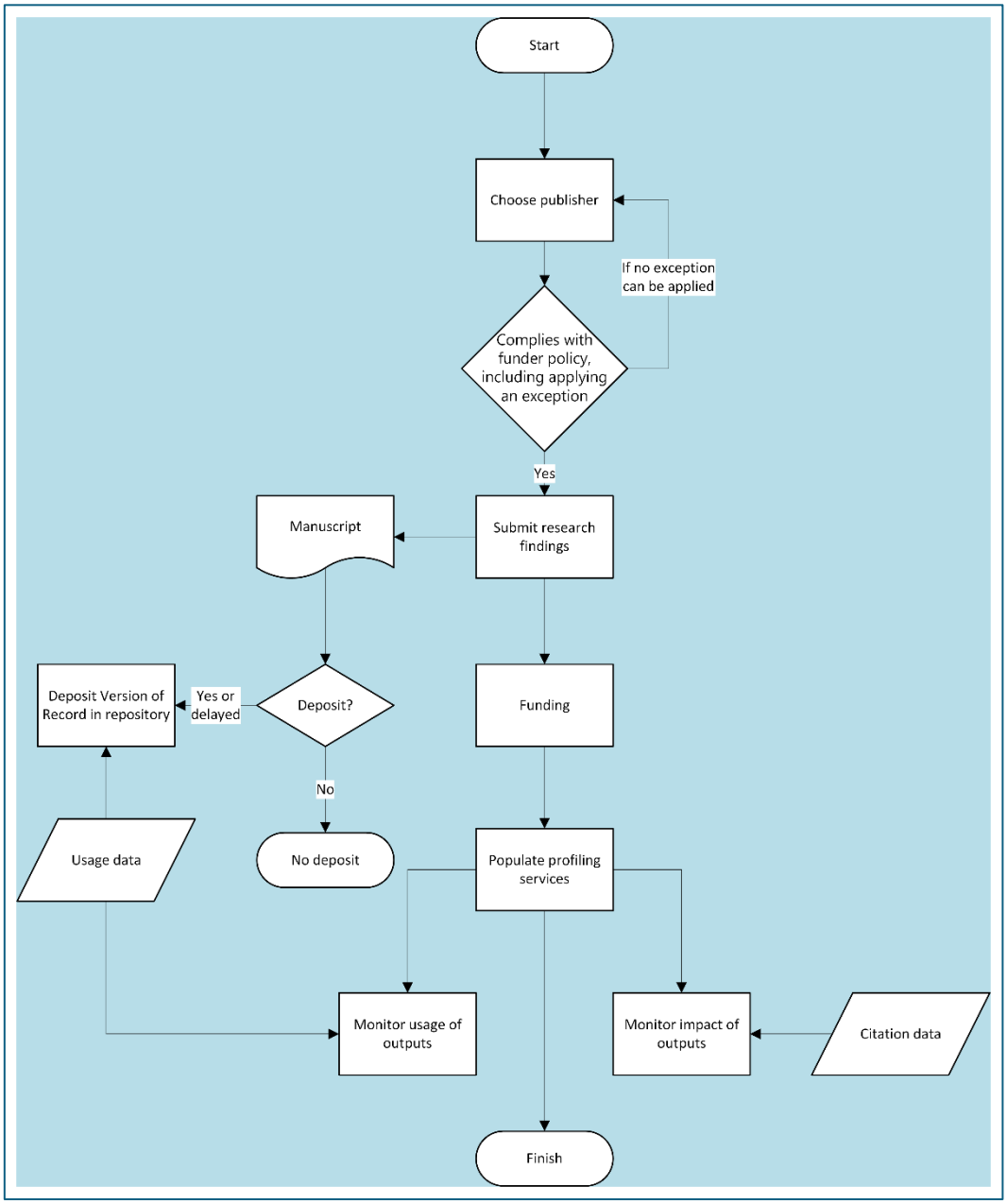
Publish research findings (author)	Tools and services	Object or stakeholder to identify
Discovery, analysis, writing	(out of scope)	
Deposit data set	(out of scope)	
Choose publisher; check permission	• Compliance checking infrastructure	• Organisation - publisher
Check funder policy		• Organisation - funder • Research project
Submit research findings	• Publication infrastructure • Quality assurance infrastructure	• Person - author • Organisation - publisher • Research project • Grant award • Entity/Material - manuscript
Deposit in repository	• Hosting, delivery • Discovery	• Person - author • Organisation - funder • Research project • Grant award • Entity/Material - manuscript
Funding for publisher (BPC, other sources)	(out of scope)	

5.2 BUILD AND MANAGE ACADEMIC PROFILE

Table 3 Build and manage academic profile

Build and manage academic profile	Tools and services	Object or stakeholder to identify
Populate profiling services	• Monitoring and measuring of impact	• Person - author • Entity/Material - publication • Research project
Monitor usage of outputs		
Monitor impact of outputs		

Figure 1 Publish and manage profile

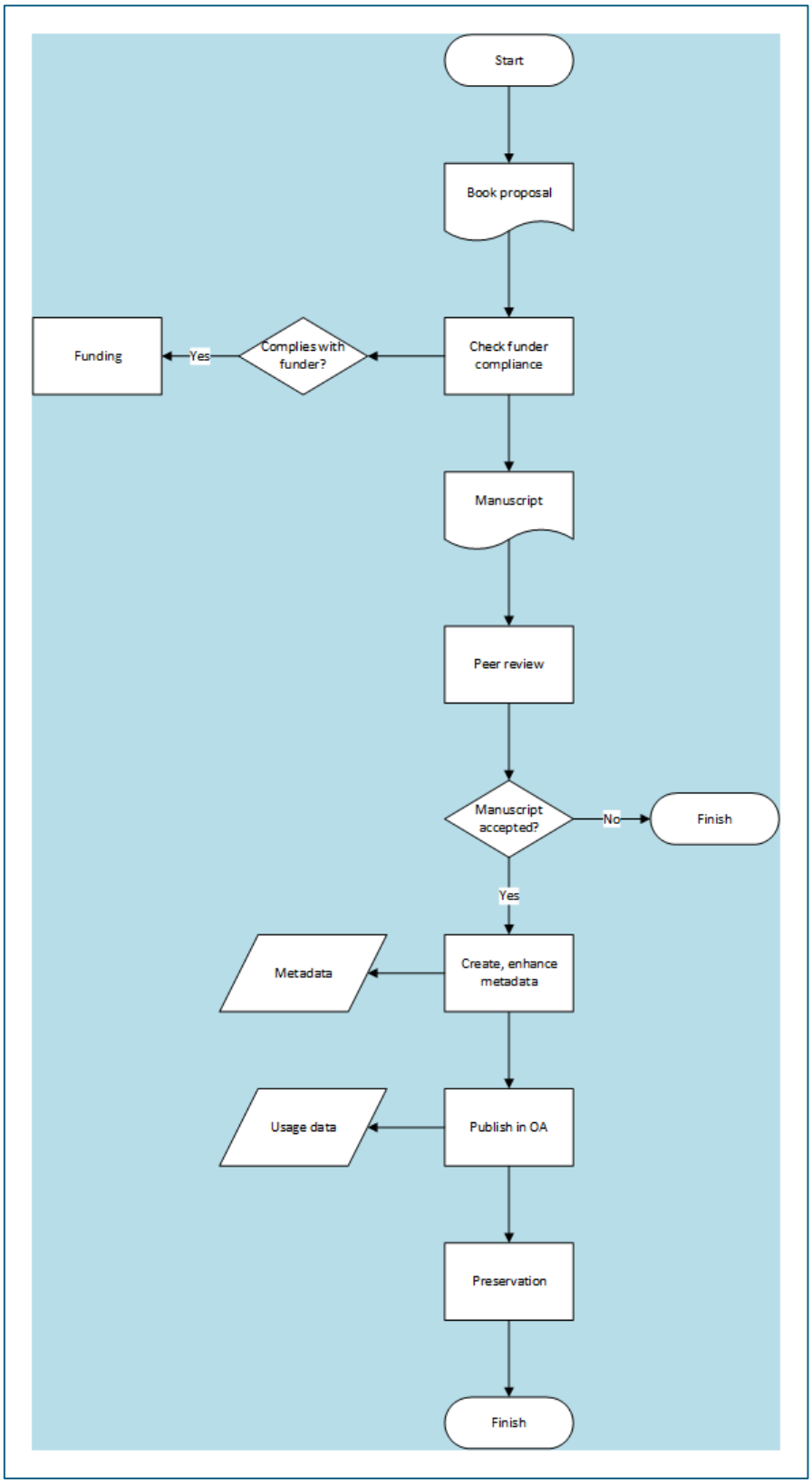


5.3 PUBLISH RESEARCH FINDINGS (PUBLISHER)

Table 4 Publish research findings (publisher)

Publish research findings (publisher)	Tools and services	Object or stakeholder to identify
Publishing platforms, including peer review and manuscript submission systems	• Publication infrastructure	• Person - author • Organisation - publisher • Research project • Grant award • Entity/Material - manuscript
Create, enhance metadata	• Hosting, delivery • Discovery	• Person - author • Organisation - publisher • Research project • Entity/Material - manuscript
Check funder policies	• Compliance checking infrastructure	• Person - author • Organisation - publisher • Organisation – funder • Research project • Grant award • Research project
Disseminate in OA	• Publication infrastructure • Hosting, delivery • Discovery	• Person - author • Organisation - publisher • Research project • Grant award • Entity/Material - publication
Monitor usage of outputs	• Monitoring and measuring of impact	• Person - author • Organisation - publisher • Organisation - funder • Research project • Grant award • Entity/Material - publication
Monitor impact of outputs		
Preserve content	• Preservation	• Person - author • Organisation - publisher • Entity/Material - publication
Standards; quality checks	• Open access engagement and advocacy	• Organisation - publisher

Figure 2 Publish research findings

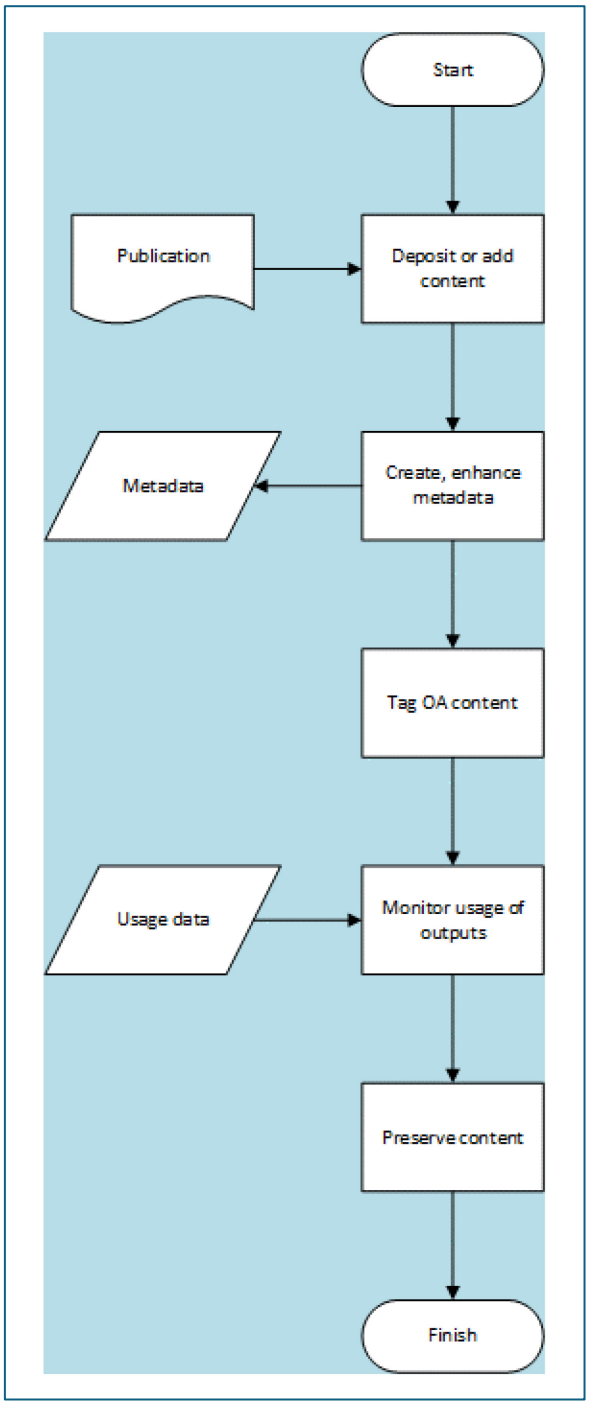


5.4 RUN REPOSITORY/LIBRARY

Table 5 Run repository/library

Run repository/library	Tools and services	Object or stakeholder to identify
Deposit content	• Publication infrastructure • Hosting, delivery	• Person - author • Organisation - publisher • Organisation - library • Organisation - funder • Research project • Grant award • Entity/Material - publication
Create/enhance metadata of newly acquired documents	• Hosting, delivery • Discovery	• Person - author • Organisation - publisher • Organisation - library • Organisation - funder • Research project • Grant award • Entity/Material - publication
Tag OA content: update metadata of existing documents in possession		• Person - author • Organisation - publisher • Organisation - library • Entity/Material - publication
Monitor usage of outputs	• Monitoring and measuring of impact	• Person - author • Organisation - publisher • Organisation - library • Organisation - funder • Research project • Grant award • Entity/Material - publication
Preserve content	• Preservation	• Organisation - library • Entity/Material - publication

Figure 3 Run repository / library

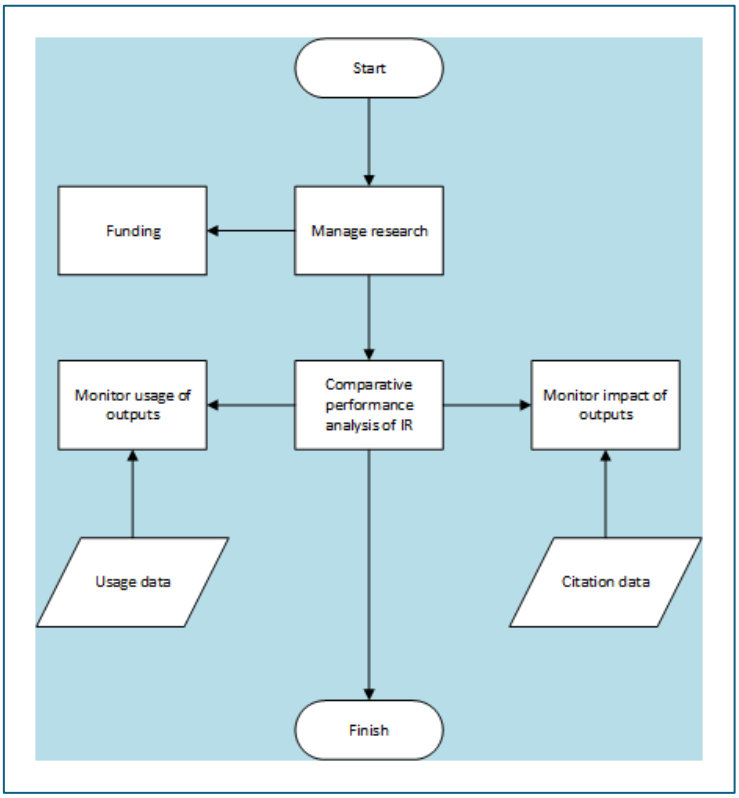


5.5 MANAGE RESEARCH (INSTITUTION)

Table 6 Manage research (institution)

Manage research (institution)	Tools and services	Object or stakeholder to identify
Comparative performance analysis of IR	• Monitoring and measuring of impact	• Organisation - institution • Entity/Material - publication
Monitor usage of outputs		• Person - author • Organisation - publisher • Organisation - library • Organisation - funder • Research project • Grant award • Entity/Material - publication
Monitor impact of outputs		
Funding for publisher (BPC, other sources)	(out of scope)	

Figure 4 Manage research (institution)

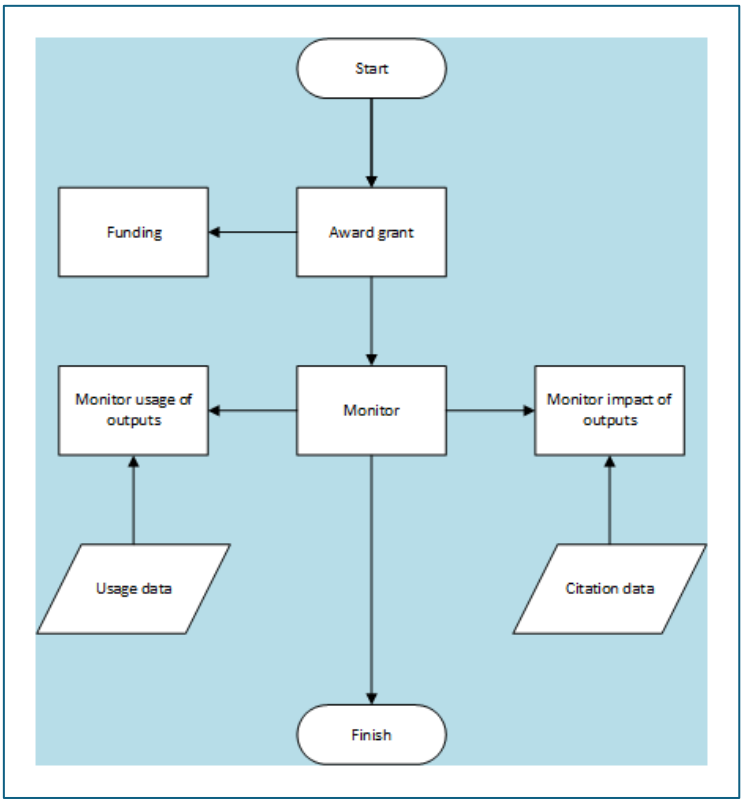


5.6 MANAGE RESEARCH (FUNDER)

Table 7 Manage research (funder)

Manage research (funder)	Tools and services	Object or stakeholder to identify
Award grant	• Compliance checking infrastructure	• Person - author • Organisation - funder • Research project • Grant award
Funding for publisher (BPC, other sources)	• Compliance checking infrastructure	• Person - author • Organisation - publisher • Research project • Grant award
Monitor usage of outputs	• Monitoring and measuring of impact	• Person - author • Organisation - publisher • Organisation - funder • Research project • Grant award • Entity/Material - publication
Monitor impact of outputs		

Figure 5 Manage research (funder)



5.7 PROMOTE OPEN ACCESS

Table 8 Promote open access

Promote open access	Tools and service	Object or stakeholder to identify
Develop OA policy	• Open access engagement & advocacy • Monitoring and measuring of impact	• Person - author • Organisation - publisher • Organisation - institution • Organisation - funder
Advocate to researchers	• Open access engagement & advocacy	• Person - author • Organisation - publisher • Organisation - funder

6. OVERVIEW: SHARED TASKS

To enable further analysis, this chapter depicts the described infrastructure, its users and the entities. The sub-sections are based on the infrastructure classification introduced in Chapter 4, Technical Infrastructure classification / inventory. The classification allows us to group infrastructure needed to perform a certain task, irrespective of stakeholders, for example, authors, publishers and funders are all engaged in compliance checking. This allows us to explore their relations and the exchange of information that is required. The exchanged information will comprise data about organisations or objects, giving us an indication of metadata needs. In other words, these are cross sections of the workflows, based on shared tasks.

By focusing on the tasks shared by the stakeholders, we get a sense of overlapping interests. This helps us to identify gaps in the infrastructure.

6.1 LEGEND AND SYMBOLS USED

Each figure in Chapter 6.3 and beyond contains several columns and rows. The left-hand column depicts the stakeholders as symbols which are listed in Table 9 Stakeholders: Symbols used. The next eight columns list the infrastructure classification. The right-hand column represents the identifiable objects. You will notice that stakeholders also are listed as an identifiable object(s) as well as symbols in Table 9. Furthermore, the shading in the 'infrastructure columns' illustrates whether it is used by a certain stakeholder.

Table 9 Stakeholders: Symbols used

Symbol	Description
	Person – Author
	Organisation – Publisher
	Organisation – Institution
	Organisation – Funder

Table 10 Objects to identify: Symbols used

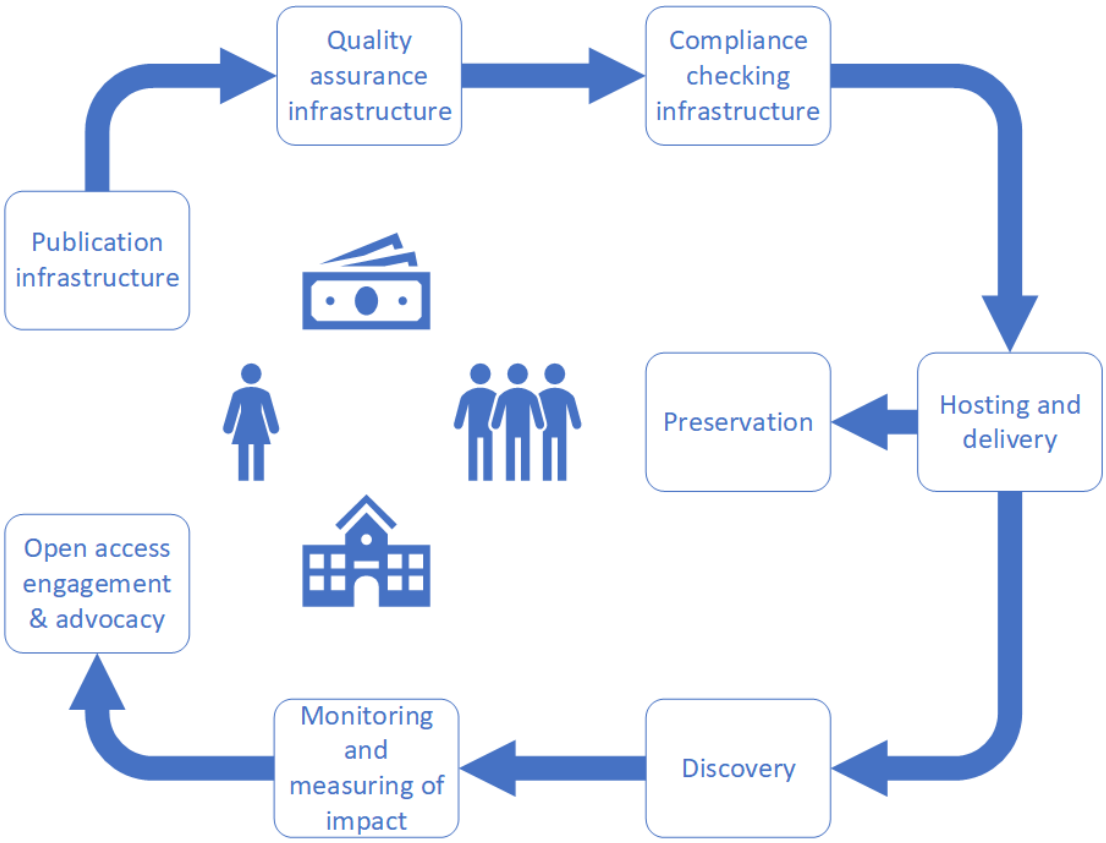
Symbol	Description
	Entity/Material – manuscript
	Entity/Material – publication
	Organisation – library
	Research project
	Grant award

6.2 CONNECTING THE INFRASTRUCTURE

Infrastructure is used by all stakeholders to perform their shared tasks. The tasks are connected, starting with the publication of research outputs, followed by quality assurance and compliance checking. The resulting publication is made available OA, which leads to discovery. The hosted publication must be preserved. All stakeholders need to monitor the impact of the publication and the results inform engagement and advocacy. The infrastructure connections consist of metadata about objects such as the manuscript or the grant award.

The following sections describe the infrastructure, the stakeholders, the tasks, and objects to identify.

Figure 6 Connected infrastructure



6.3 PUBLICATION INFRASTRUCTURE

Publication infrastructure is used by authors to submit research findings to publishers; the next steps are quality assurance and checking the compliance to funder requirements. These will be discussed in the following sections.

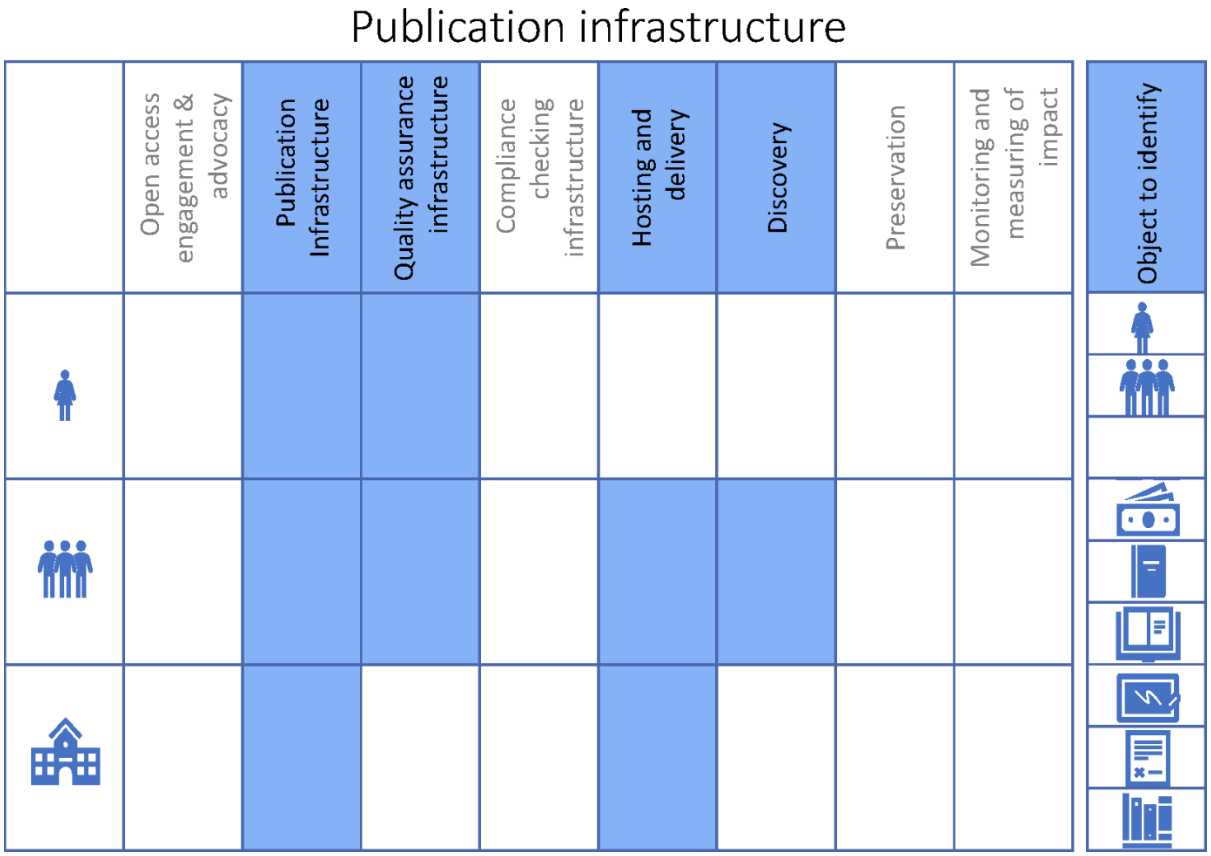
When a manuscript has been transformed to the version of record, it needs to be disseminated. This is a task for publishers, and for institutions. Publishers will disseminate the publication using their own platforms and OA platforms. Authors in conjunction with institutions might deposit the version of record or the author's accepted manuscript in a repository. This process is described in more details in Chapter 6.6, Hosting and delivery.

The following table lists the stakeholders, tasks, and the objects to identify in publication infrastructure:

Table 11 Publication infrastructure

Stakeholder	Task	Object to identify								
		Entity/Material - manuscript	Entity/Material - publication	Organisation - funder	Organisation - institution	Organisation - library	Organisation - publisher	Person - author	Research project	Grant award
Author	Submit research findings	**X**					**X**	**X**	**X**	**X**
Publisher	Publishing platforms, including peer review and manuscript submission systems	**X**					**X**	**X**	**X**	**X**
Publisher	Disseminate in OA		**X**	**X**			**X**	**X**	**X**	**X**
Institution	Deposit content		**X**	**X**		**X**	**X**	**X**	**X**	

Figure 7 Publication infrastructure



6.4 QUALITY ASSURANCE INFRASTRUCTURE

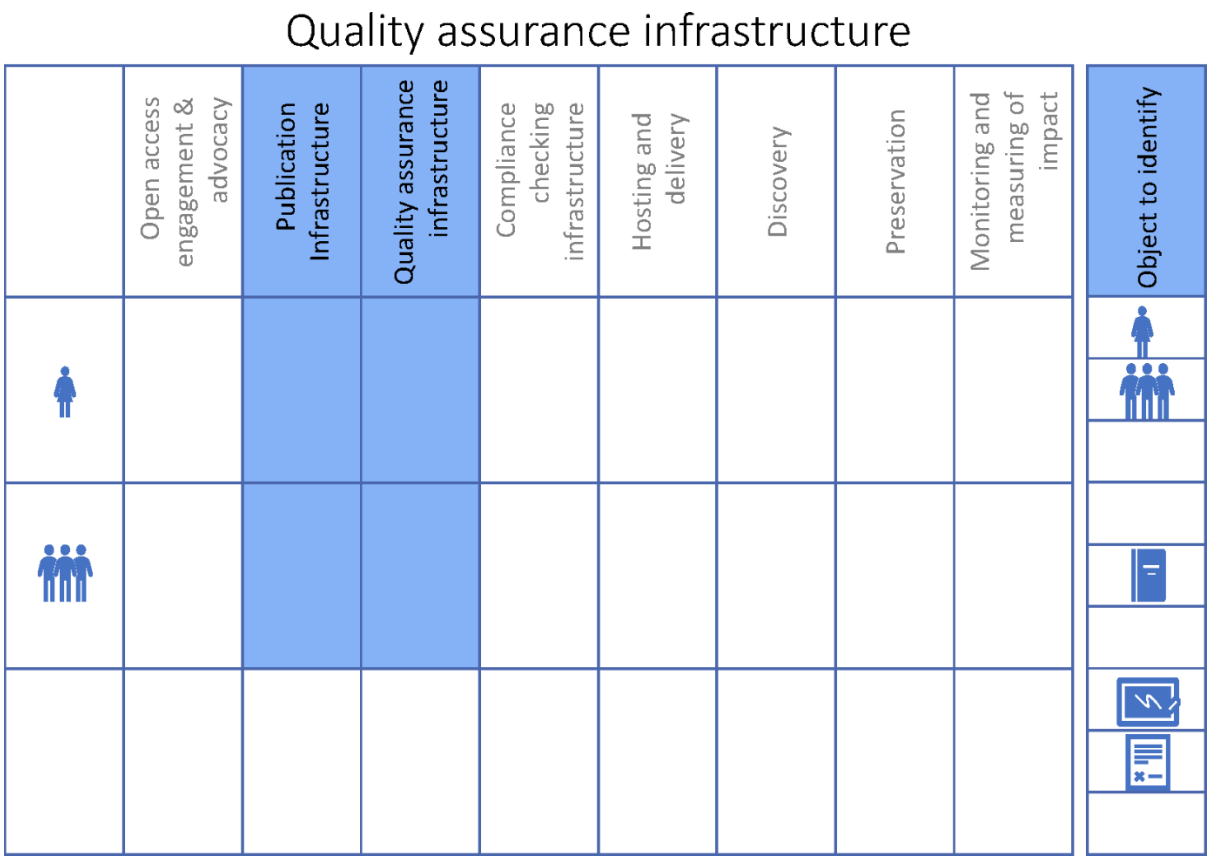
Quality assurance of the submitted manuscript is a shared responsibility of the author and the publisher.

The following table lists the stakeholders, tasks, and the objects to identify for quality assurance:

Table 12 Quality assurance infrastructure

Stakeholder	Task	Object to identify								
		Entity/Material - manuscript	Entity/Material - publication	Organisation - funder	Organisation - institution	Organisation - library	Organisation - publisher	Person - author	Research project	Grant award
Author	Submit research findings	X					X	X	X	X
Publisher	Publishing platforms, including peer review and manuscript submission systems	X					X	X	X	X

Figure 8 Quality assurance infrastructure



6.5 COMPLIANCE CHECKING INFRASTRUCTURE

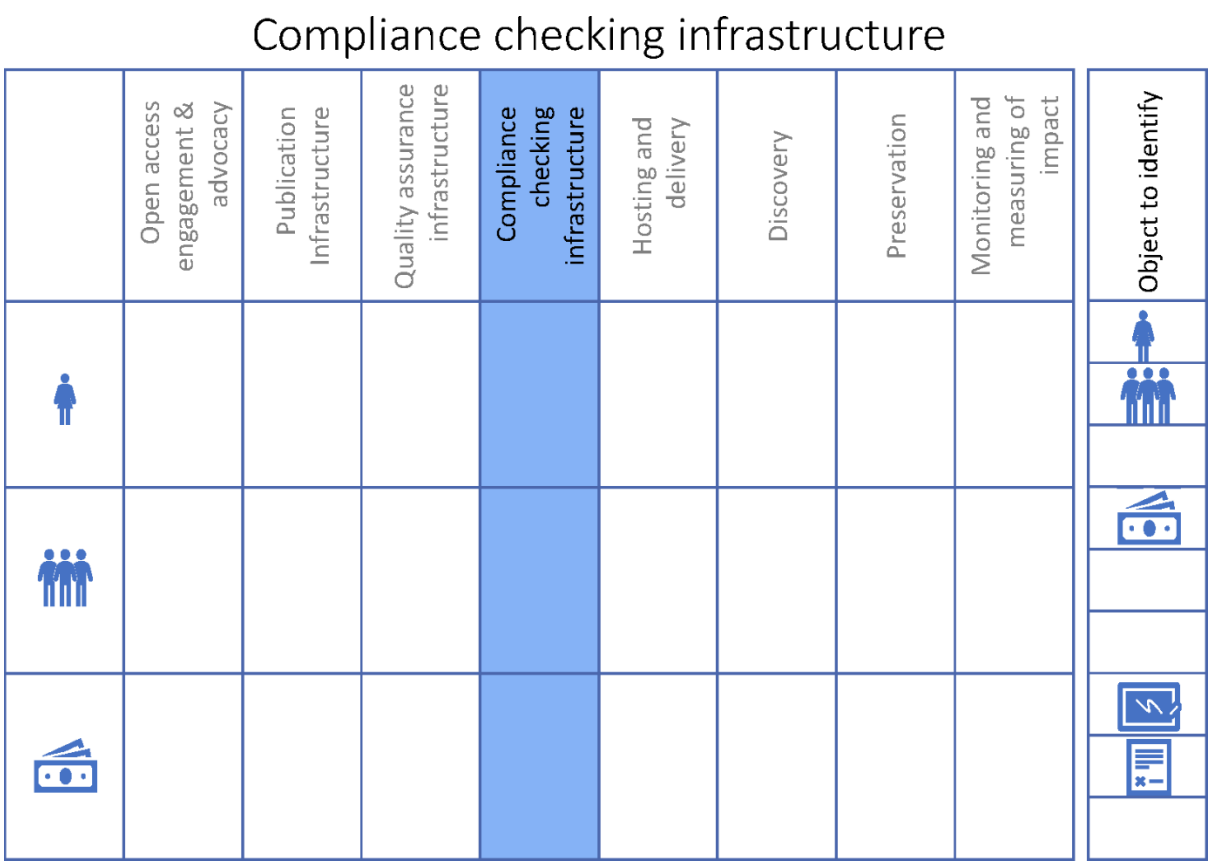
Compliance checking takes places at several stages in the process. An author needs to make sure that the selected publisher complies with the requirement of the funder, when considering submitting the research findings. Also, a publisher will periodically check the requirements of funders to make sure its offering is still compliant. Funders will invest in the research done by authors by awarding a grant and might also fund a publisher directly to enable the publication of the research findings.

The following table lists the stakeholders, tasks, and the objects to identify:

Table 13 Compliance checking infrastructure

Stakeholder	Task	Object to identify								
		Entity/Material - manuscript	Entity/Material - publication	Organisation - funder	Organisation - institution	Organisation - library	Organisation - publisher	Person - author	Research project	Grant award
Author	Choose publisher; check permission						X			
Author	Check funder policy			X					X	
Publisher	Check funder policies			X			X	X	X	X
Funder	Award grant			X				X	X	X
Funder	Funding for publisher						X	X	X	X

Figure 9 Compliance checking infrastructure



6.6 HOSTING AND DELIVERY

Hosting and delivery infrastructure is needed to make the version of record available. The publisher might make the document available on its own platform and/or a dedicated OA platform such as JSTOR or the OAPEN library. Authors and institutions might deposit the publication in a repository; this may be the version of record or the author's accepted manuscript.

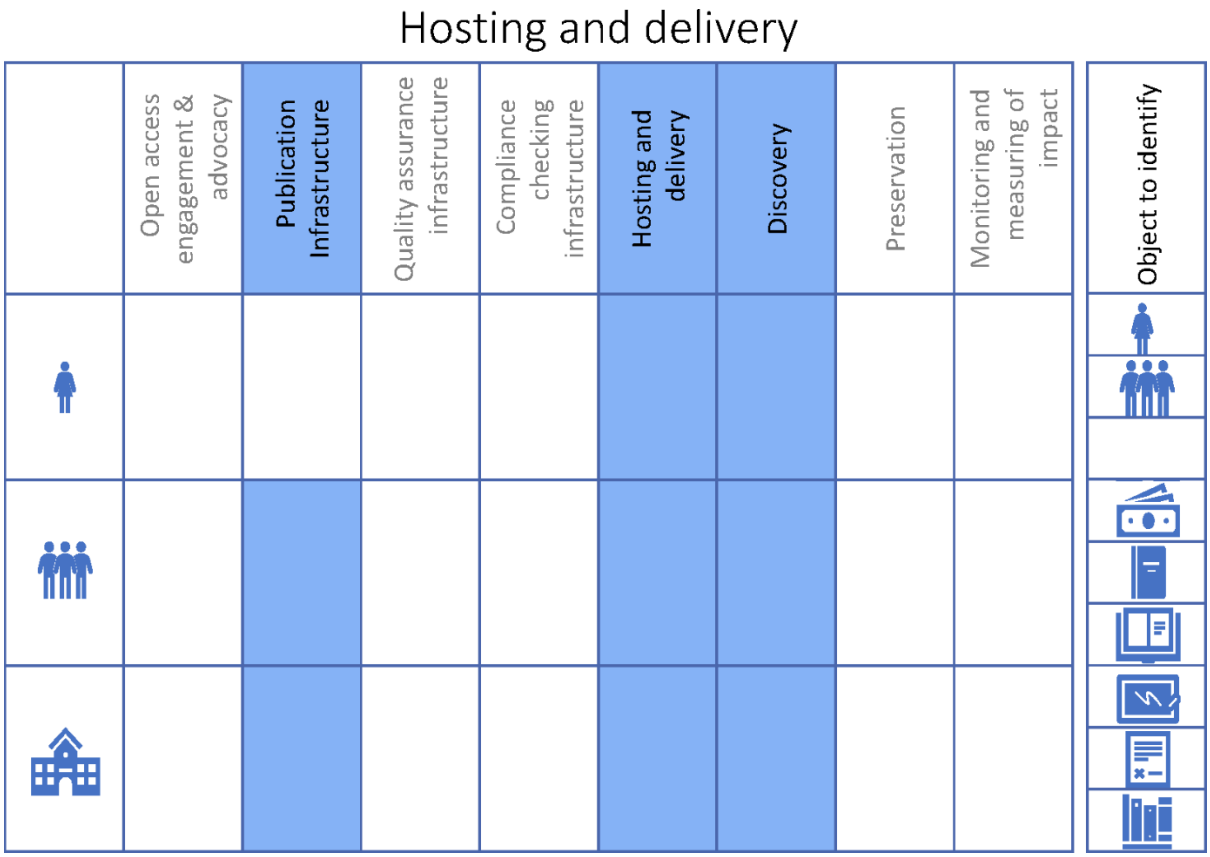
These tasks are closely intertwined with discovery, which is discussed in the next chapter.

The following table lists the stakeholders, tasks, and the objects to identify:

Table 14 Hosting and delivery

Stakeholder	Task	Object to identify								
		Entity/Material - manuscript	Entity/Material - publication	Organisation - funder	Organisation - institution	Organisation - library	Organisation - publisher	Person - author	Research project	Grant award
Author	Deposit in repository	X		X				X	X	X
Publisher	Create, enhance metadata	X					X	X	X	
Publisher	Disseminate in OA		X				X	X	X	X
Institution	Deposit content		X	X		X	X	X	X	X
Institution	Create/Enhance metadata		X	X		X	X	X	X	X
Institution	Tag OA content		X			X	X	X		

Figure 10 Hosting and delivery



6.7 DISCOVERY

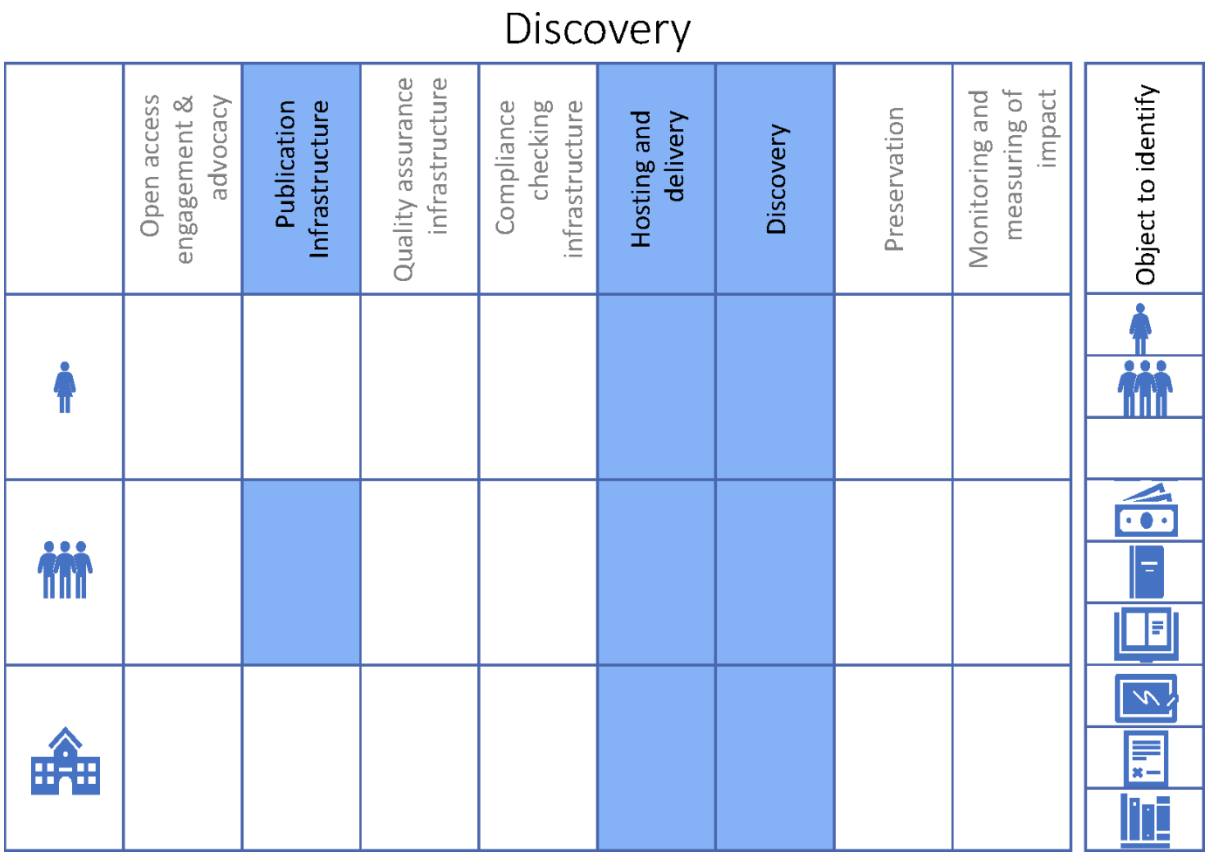
When a document is available on an OA platform, it needs to reach its intended audience. This is done by adding the correct metadata; a task for each stakeholder who uploads or deposits content. Furthermore, institutions might be managing libraries collections. Part of discovery is tagging the availability of an OA version of listed documents.

The following table lists the stakeholders, tasks, and the objects to identify:

Table 15 Discovery

Stakeholder	Task	Object to identify								
		Entity/Material - manuscript	Entity/Material - publication	Organisation - funder	Organisation - institution	Organisation - library	Organisation - publisher	Person - author	Research project	Grant award
Author	Deposit in repository	X		X				X	X	X
Publisher	Create, enhance metadata	X					X	X	X	
Publisher	Disseminate in OA		X				X	X	X	X
Institution	Create/Enhance metadata		X	X		X	X	X	X	X
Institution	Tag OA content		X			X	X	X		

Figure 11 Discovery



6.8 PRESERVATION

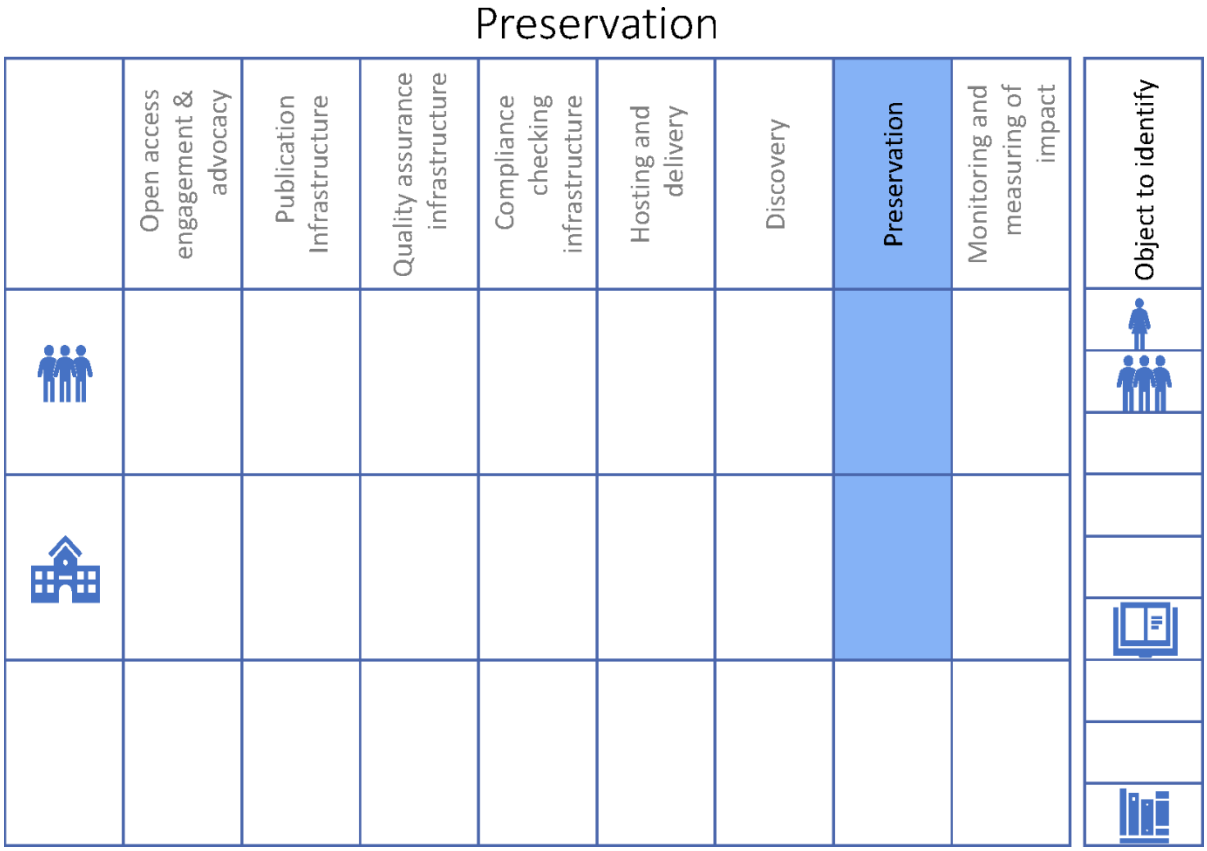
The publisher and institution are stakeholders that are responsible for hosting OA publications. They also need to enable the preservation of these titles.

The following table lists the stakeholders, tasks, and the objects to identify:

Table 16 Preservation

Stakeholder	Task	Object to identify								
		Entity/Material - manuscript	**Entity/Material - publication**	**Organisation - funder**	**Organisation - institution**	**Organisation - library**	**Organisation - publisher**	**Person - author**	**Research project**	**Grant award**
Publisher	Preserve content		**X**				**X**	**X**		
Institution	Preserve content		**X**			**X**				

Figure 12 Preservation



6.9 MONITORING AND MEASURING OF IMPACT

Each stakeholder needs to monitor the impact of the publications they have been involved with. Thus, each stakeholder monitors usage data, such as the number of views and downloads; and impact through the number of citations and altmetric data such as mentions in social media.

Furthermore, authors populate profiling services with their publications. Some of these might be part of the organisation the author is affiliated with, such as the Current Research Information (CRIS) systems, others are of a more general nature, such as Open Researcher and Contributor ID (ORCID) or Impactstory. Institutions that manage repositories will need to compare its performance.

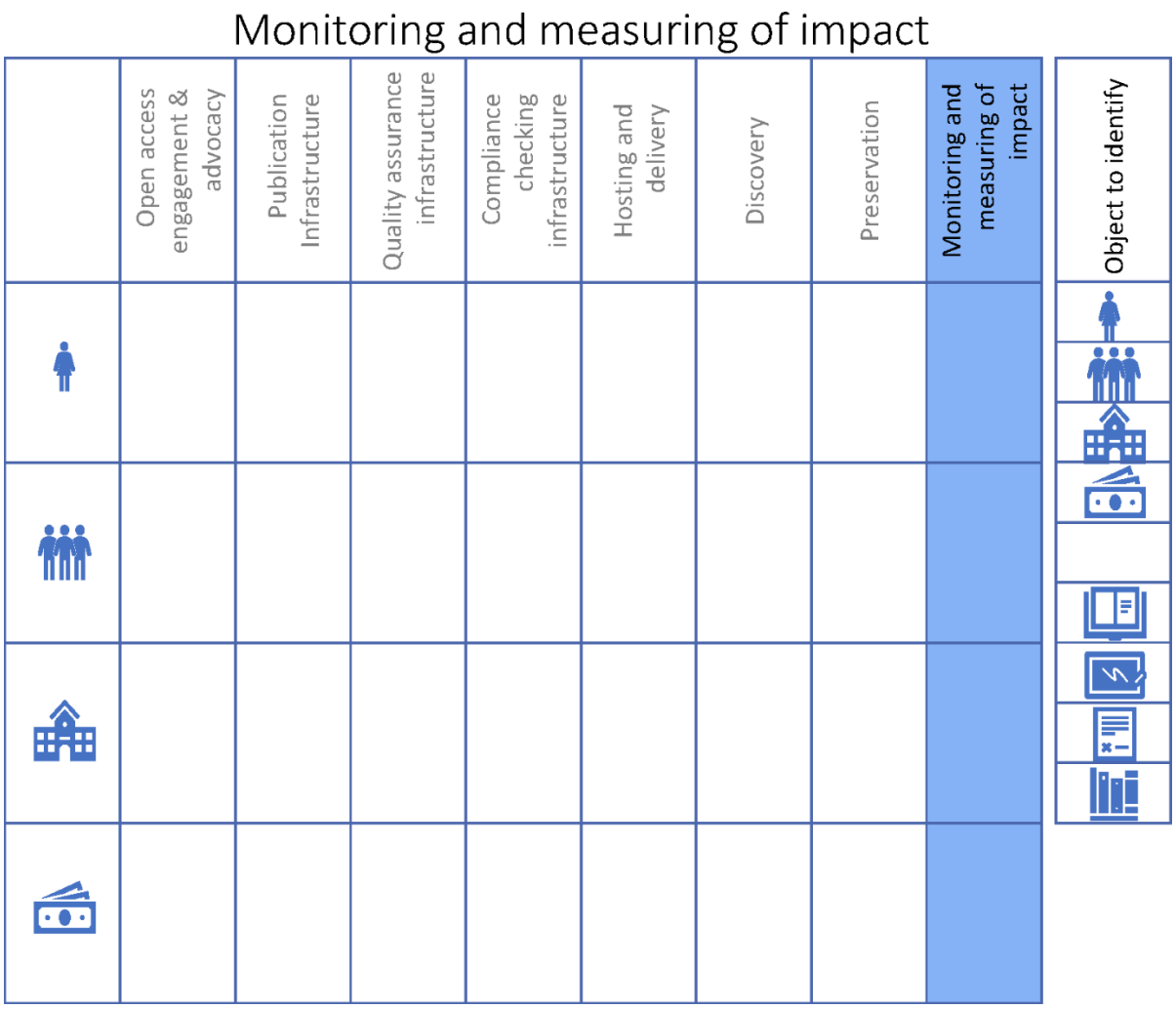
Monitoring and measuring the impact of open access publishing is closely connected to engagement and advocacy, as mentioned in Chapter 6.1, Legend and symbols used.

The following table lists the stakeholders, tasks and the objects to identify for monitoring and measuring impact:

Table 17 Monitoring and measuring of impact

Stakeholder	Task	Object to identify								
		Entity/Material - manuscript	Entity/Material - publication	Organisation - funder	Organisation - institution	Organisation – library	Organisation - publisher	Person - author	Research project	Grant award
Author	Populate profiling services		X					X	X	
Author	Monitor usage of outputs		X					X	X	
Author	Monitor impact of outputs		X					X	X	
Publisher	Monitor usage of outputs		X	X			X	X	X	X
Publisher	Monitor impact of outputs		X	X			X	X	X	X
Institution	Comparative performance analysis of IR		X		X					
Institution	Monitor usage of outputs		X		X		X	X	X	X
Institution	Monitor impact of outputs		X		X		X	X	X	X
Funder	Monitor usage of outputs		X	X			X	X	X	X
Funder	Monitor impact of outputs		X	X			X	X	X	X
Publisher; Institution; Funder	Develop OA policy			X	X		X	X		

Figure 13 Monitoring and measuring of impact



6.10 OPEN ACCESS ENGAGEMENT AND ADVOCACY

OA engagement and advocacy can be seen at two levels: at the level of individual publishers and as a shared commitment by the publisher, institution and funder to develop their OA policy. At the first level, each individual publisher needs to make sure its offering conforms to the standards and quality requirements of funders.

Taking the second level into account, it is important to consider that engagement and advocacy is an important activity for clarifying OA requirements, identifying available options, and benefits for authors and other stakeholders. Furthermore, all stakeholders have a part to play and they should work together to promote OA via targeted activities and resources. After all, without engagement and advocacy the infrastructure won't be used.

While the task where publishers check compliance with funder mandates could be viewed as a one-on-one exchange of information, the development of an OA policy involves many stakeholders, both at the sending and the receiving end. It requires the cooperation between publishers, institutions, who may have their own institutional commitments, and funders. The institution's tasks also comprise managing repositories and libraries. Both repositories and libraries play an important role in the engagement and advocacy for OA but are not depicted separately.

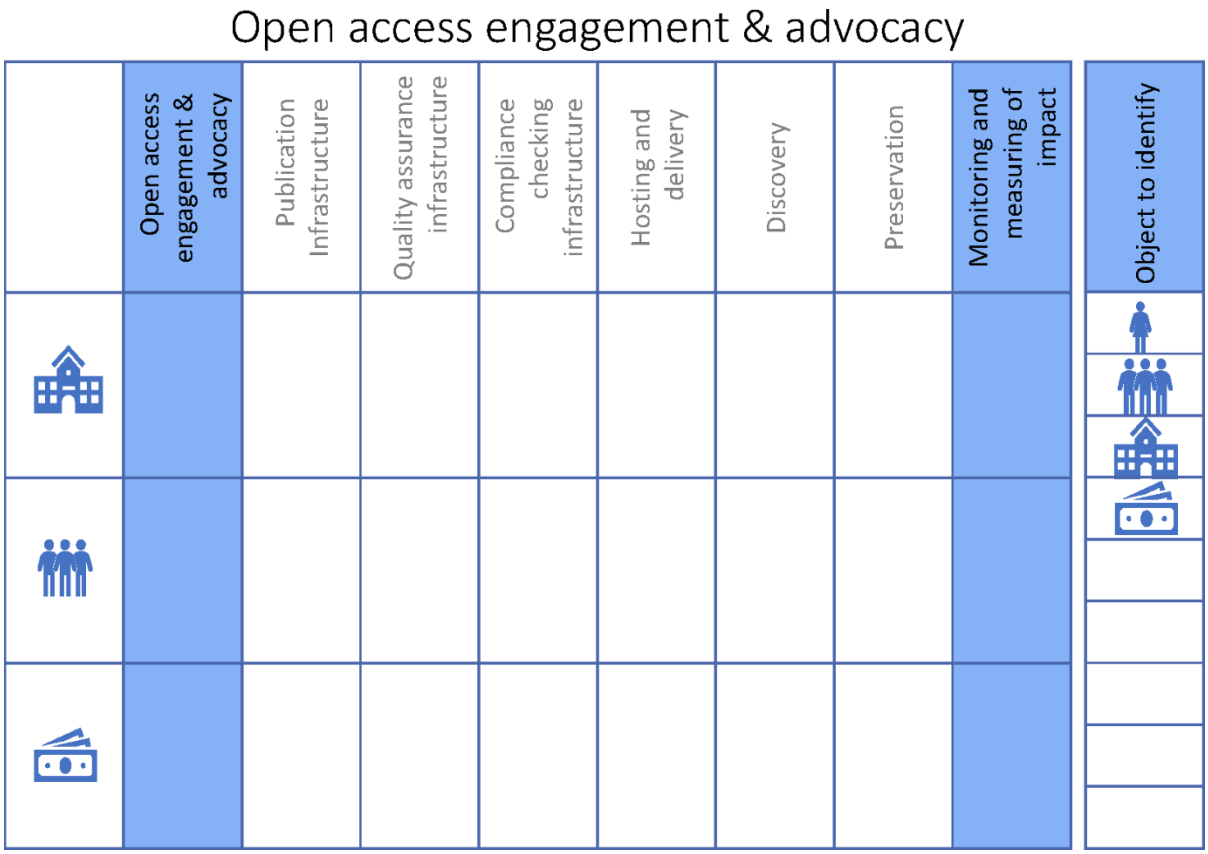
The development of an OA policy is informed by the monitoring and measuring of impact: are the goals of the policies met, and what areas need further attention? Engagement and advocacy can increase compliance with the OA policy and further OA more broadly. The infrastructure can be used to measure the impact of the policy.

The following table lists the stakeholders, tasks, and the objects to identify for OA engagement and advocacy:

Table 18 Open access engagement & advocacy

Stakeholder	Task	Object to identify								
		Entity/Material - manuscript	Entity/Material - publication	Organisation - funder	Organisation - institution	Organisation - library	Organisation - publisher	Person - author	Research project	Grant award
Publisher	Standards; quality checks						X			
Publisher; Institution; Funder	Develop OA policy			X	X		X	X		

Figure 14 Open access and advocacy



7. TECHNICAL INFRASTRUCTURE CLASSIFICATION TABLE

Chapter 4, Technical Infrastructure classification / inventory, of this report classified several technical infrastructure areas for OA books. As part of Table 19 Technical infrastructure classification, each infrastructure classification has been subdivided based on two axes: governance and specialisation. The governance subdivision displays whether the infrastructure or service is public or community managed versus proprietary or commercial. The second subdivision clarifies whether the infrastructure or service is focused on OA books or chapters; OA journals or OA in general. Infrastructure and services catering for OA journals may be used as examples for their OA books counterparts, especially when such services are missing or are less mature.

Please note that certain technical infrastructure may have been deemed key infrastructure for multiple infrastructure classification categories. Emerging infrastructure currently in development has been indicated with an asterisk (*), a concise description of which is available in Chapter 7.1, Emerging infrastructure description, following the table.

Table 19 Technical infrastructure classification

*) emerging infrastructure

	General		**OA books**		**OA Journals**	
	Public/community led	Proprietary/ commercial	Public/community led	Proprietary/ commercial	Public/community led	Proprietary/ commercial
Open access engagement & advocacy	- SPARC Europe - OASIS - Think, Check, Submit - Open Access Tracking Project (OATP) - ROARMAP - New University Presses (NUP) toolkit - Ask UP - Transitioning Society Publications to OA (TSPOA)	- KU Open Research Community	- OAPEN - DOAB - OAPEN OA Books Toolkit - OA Books Network - The COPIM project's work on Revenue Infrastructure and Management Platform*		- Compass to Publish*	
Publication infrastructure	- NUP toolkit - SComCat* - JaneWay	- Ubiquity Preprint Repository	- Open Monograph Press - OpenEdition Books - UC Digitalis (University of Coimbra) - SHARE Press (Naples) - OPERAS Publishing Services Portal* - Manifold - Fulcrum	- Atypon - Silverchair - Ubiquity Press - F1000 - Klopotek - Virtusales - Firebrand	- Open Journal Systems	
Quality assurance infrastructure			- Kriterium - DOAB Certification service *			

	General		OA books		OA Journals	
	Public/community led	Proprietary/ commercial	Public/community led	Proprietary/ commercial	Public/community led	Proprietary/ commercial
Compliance checking infrastructure	- DCC Funder policy (Data only)		- SHERPA services for books* - The COPIM project's work on Revenue Infrastructure and Management Platform*		- SHERPA Romeo - SHERPA Juliet - SHERPA Fact - SHERPA REF - Journal Checker Tool - OA Switchboard*	- ChronosHub Journal Finder
Hosting and delivery	- SocArxiv - MediArxiv - Project MUSE - JSTOR - OpenDOAR - Longleaf Services - BiblioVault - Folio.org - EPrints - UK Date Service - Zenodo	- KU Open Services - ResearchGate - Academia.edu - Ingram CoreSource - Figshare - Amazon.com	- OAPEN Library - OpenEdition books - NCBI Bookshelf	- Open Research Library - Google Books		
Discovery	- OPERAS Discovery Service (TRIPLE)* - OCLC WorldCat KnowledgeBase, OCLC Worldshare Management Services - Unpaywall - Jisc Library Hub - Discover; Cataloguing Service; Compare - SimplyE	- EBSCO Discovery Service - Google Scholar - ExLibris ALMA, Ex Libris ALMA Central Knowledge Base - Open Research Library - BDS Live - ProQuest Summon	- DOAB - The COPIM project's work on Revenue Infrastructure and Management Platform*			- EndNote Click (formerly Kopernio)

	General		**OA books**		**OA Journals**	
	Public/community led	Proprietary/ commercial	Public/community led	Proprietary/ commercial	Public/community led	Proprietary/ commercial
Preservation	- CLOCKSS - Portico - Hathi Trust		- The COPIM project's work on Revenue Infrastructure and Management Platform*		- Keepers Registry - Public Knowledge Project (PKP) Preservation Network	
Monitoring and measuring of impact	- Lens.org - OpenCitations - Impactstory - COUNTER - CrossRef - Institutional Repository Usage Statistics UK (IRUS-UK) - VIVO	- Web of Science - Scopus - Altmetrics - Dimensions - Google Scholar - KU Open Analytics - Growkudos - LibLynx - Google Analytics - Plum Analytics - Sumpletic Elements - Elsevier PURE - Clarivate Converis	- Open Access eBook Usage (OAeBU) data trust * - OPERAS Metrics service* - OpenAPC	- Clarivate Analytics Book Citation Index	- Publications Router Jisc	

7.1 EMERGING INFRASTRUCTURE DESCRIPTION

There are a number of technical infrastructures currently in development and some that have been marked as 'emerging' in Table 19 Technical infrastructure classification, above. For each of these emerging infrastructures a concise description of its main deliverables, services and its functions are provided below.

Compass to publish: Compass to publish is a project developed by the Liège University Library. It helps to determine the degree of OA journals requiring or hiding Article Processing Charges (APCs) using a criteria-based evaluation. It also aims to help the scholarly community to better understand predatory journals and publishers. Compass to publish does not evaluate quality of a journal, but its degree of authenticity. (Liège University Library) - (ULIÈGE Library, 2019)

COPIM (Community-led Open Publication Infrastructures for Monographs) is an international partnership of researchers, universities, librarians, open access book publishers and infrastructure providers. It is building community-owned, open systems and infrastructures to enable open access book publishing to flourish. It encompasses several work packages (WP):

- **COPIM WP 2 - Revenue infrastructure and management platform (COPIM WP2)**: WP2 will develop and launch a modular, scalable revenue generation and management platform for open OA books, to be made available to publishers and libraries**.** The platform will emphasise open-source software, community-owned and led open access, and will enable a broad range of economic supports for a variety of open access book outputs. WP2 will create the technical infrastructures, organisational processes, financial management procedures, and legal standards to enable these new funding channels to be sustainable long term. The revenue platform will be designed with flexible modularity, portability, and customisability as its chief features, ensuring that both emerging, smaller-scale and established, larger-scale publishers seeking to transition to open access and in need of durable, flexible business models for doing so, can benefit from it. (COPIM) - (COPIM, n.d.-a).
- **COPIM WP5 - Open Dissemination System (ODS)**: WP5 is developing technical protocols and infrastructure to better integrate OA books into institutional library, digital learning, and repository systems. This will support wider discovery and dissemination of OA books. WP5 will build an Open Dissemination System (ODS) for OA books and a shared "best practices" digital catalogue. The ODS is to be built as a decentralised system, using open-source code, open protocols and standards and distributed databases—all under collective control. Doing so will ensure the system cannot be operated for the benefit of a single entity (either commercial or not). (COPIM) - (COPIM, n.d.-b).
- **COPIM WP7 - Archiving and digital preservation (COPIM WP7)**: WP7 will identify the key challenges associated with archiving research monographs in all their variation and complexity and develop new solutions. Technical methods for effectively archiving complex digital research publications and for creating an integrated collection of content in different formats. A model which enables the expansion and uptake of the methods by other presses and libraries. Recommendations for best practice around legal and copyright issues that complicate effective archiving of complex digital research publications. (COPIM) - (COPIM, n.d.-c)

DOAB certification service: The DOAB certification service is operated by the Directory of Open Access Books (DOAB), which collects the variety of peer reviewing practices from hundreds of monograph publishing houses, categorises them, and provides a single access point to the list of certified peer reviewed monographs available in OA across the world. The service is provided as one of the central services for OPERAS. It operates as a quality assurance service for the benefit of readers and the service providers working with them, such as the libraries. The service currently operates as a beta service. The DOAB certification service full release is planned for 2021. (OPERAS) - (OPERAS Consortium, 2019a).

OPERAS metrics service: The metrics service is jointly operated by Ubiquity Press, Open Book Publishers and KU Research and collects usage and impact metrics related to OA monographs from many different sources and allows for their access, display and analysis from a single access point. The metrics service currently operates as a beta service. The OPERAS metrics suite is comprised of a shared data model, various open-source tools and services designed to serve the various components used by the shared OPERAS database and API used for a diverse range of usage and impact metrics including but not limited to downloads, web visits, tweets, Wikipedia mentions. It is free for publishers and users to use. The metrics service full release is planned for 2021. (OPERAS) - (OPERAS Consortium, 2019c).

OPERAS publishing services portal: The publishing service portal (PSP) will be operated by the University of Torino and Lexis Compagnia Editoriale. PSP collects the publishing and scholarly communication services that OPERAS members offer in OPERAS marketplace and gives access to their description from a single access portal. The PSP will be composed of two parts: a presentation of the services as a catalogue and a wizard that walks researchers through a series of questions towards the service offering that best fits their needs. The PSP beta release is planned for 2022. (OPERAS) - (OPERAS Consortium, 2019d)

OPERAS discovery service (TRIPLE) - The discovery service is operated by Huma-Num and will provide European researchers a single point to discover social sciences and humanities (SSH) open scholarly resources such as data, publications, and other researchers and projects which are currently scattered across local repositories. The discovery service allows for the discovery of resources in different languages from a variety of sources across multiple countries. The service will be based on the existing French ISIDORE platform provided by Huma-Num, with many more extra languages to be discovered, and additional innovative services directly plugged-in the platform such as annotation service, recommendation service, trust-building service, visualisation service, etc. The discovery service is currently under development. Its operation is planned for 2023 and will be free for users. (OPERAS) -(OPERAS Consortium, 2019b).

OA switchboard - The aim of the OA switchboard initiative is to facilitate the fulfilment of OA strategies across business models, policies, and agreements, by connecting systems and improving the information exchange between authors, publishers, funders and institutions. This will be achieved via agreeing standards for article-level information exchange 'messages' and providing a central hub to enable parties to send/receive these standardised messages. As a priority the following types of information exchange were addressed:

- **Eligibility enquiry**: help authors (and their publishers) understand – using specific article-metadata – whether a particular journal has the potential to fulfil the OA requirements of their institution and/or research funder, and whether central funding is available to pay for any OA publication charges that may be required. *Note: Prior agreements between parties are not required*.
- **Publication/payment settlement notification** (previously referred to as payment request): help at the point of acceptance or publication, to ensure the financial settlement between publisher on the one hand, and institution and/or research funder on the other, can be done. This may be via an OA publication charge, or via an applicable OA membership arrangement or offsetting/hybrid/transformative agreement. *Note: the OA Switchboard will not serve as central payment intermediary and will not therefore process any OA financial transactions.*

The OA Switchboard is operational from 1 January 2021[2]. (OA Switchboard) - (*Home | The OA Switchboard Initiative*, n.d.).

[2] As the OA Switchboard was not operational at the time of writing, it is listed here as "emerging".

Open Access eBook Usage (OAeBU) data trust: This pilot project will develop and test infrastructure, policy, and governance models to support a diverse, global data trust for usage data on OA monographs. As an international cooperative managed by the community of stakeholders in scholarly communications and operating a secure data repository and member dashboards; this data trust will be designed to align with the priorities of authors and institutions while respecting emerging ethical norms in the use of metrics. This pilot project runs through 2021. (Educopia) - (Educopia Institute, n.d.).

OpenAPC (OpenBPC): The open APC initiative releases datasets on fees paid for OA journal articles and books by universities, research institutions and funders under an open database license. Knowledge Unlatched (KU) and OpenAPC, operated by the University of Bielefeld, are expanding the OpenAPC dataset to support the inclusion of Book Processing Charges (BPCs) (OpenAPC) - (Hess, 2020).

SComCat - Scholarly communications technology catalogue: It is being developed by Antleaf for the Confederation of Open Access Repositories (COAR) as part of The next generation libraries project. In this project, Educopia, California Digital Library (CDL), and Strategies for Open Science (Stratos), in close partnership with LYRASIS, COAR, and Longleaf Services are working to advance and integrate open source publishing infrastructure to provide robust support for library publishing (Educopia) - (Educopia Institute, 2020; Ratan *et al.*, 2020).

SHERPA services for books: a central international site (similar to SHERPA services for journals) to capture funder and publisher policies in one place. Jisc currently offers four SHERPA for checking compliance with funder OA policies can be achieved with a specific journal: SHERPA FACT, SHERPA RoMEO, SHERPA Juliet, and SHERPA REF (Jisc) - (Jisc, 2020).

8. GAP ANALYSIS

The previous chapters of this report described the stakeholders, workflows, and classification of the infrastructure. An online workshop involving expert representatives from each of the stakeholder groups helped inform and validate the gaps in the infrastructure outlined in this chapter. Using the infrastructure classification as focus, Chapter 6, Overview: shared tasks, enables us to explore the relations between stakeholders engaged in comparable tasks. This chapter uses the same structure to discuss the existing gaps in the infrastructure as well as interoperability.

8.1 PUBLICATION INFRASTRUCTURE

Essentially, publication infrastructure consists of project management systems, combining feeds with a workflow management system. These systems (such as Firebrand, Klopotek, Consonance, BooksoniX and VirtuSales) come at a cost and thus result in a cost relative to the organisation's size and can impose a significant cost burden on small publishers.

The systems that smaller publishers use to dispatch metadata to various platforms may not have the appropriate fields that would be required to add the Online Information Exchange (ONIX) standard for OA books, particularly with chapter-level metadata. Systems may often lack the ability to integrate or push certain metadata in practice, such as funder information. In addition to the publication infrastructure itself, metadata creation specifically proves challenging for various smaller publishers.

Additionally, there are a couple of examples of open-source publication infrastructure available for OA books, such as Open Monograph Press, PubPub and Manifold Publishing. While these infrastructures are open and can be adopted by anyone, for those in the publication lifecycle these involve costs (financial or non-financial) typically including training, need for specific expertise and labour which are essential to consider for successful adoption. For the infrastructure provider, costs are involved in terms of maintaining and developing the infrastructure and software for the benefit of the user community.

This means that in practice, not all publishers are able to share vital metadata through their workflows. This leads to inconsistencies and a lack of downstream 'coverage' of metadata (specifically PIDs and funding details).

8.2 QUALITY ASSURANCE INFRASTRUCTURE

Quality assurance can be considered a gap for all publication types, including OA books. Academic book publishers use a variety of approaches to quality assurance, including a wide range of peer review practices as there is not one single standard for monograph publishing.

Transparency around quality assurance and various peer review practices for academic books is however perceived to be lacking. This is especially problematic for OA books, that suffer from a perceived lack of quality. Guidance from organisations such as Association of University Presses (AUP), Open Access Scholarly Publishing Association (OASPA) and DOAB addresses this to some extent. DOAB is providing the OPERAS certification service for OA books, a new service to be implemented in 2021. This service aims to certify OA book publishers based on their publishing practices, particularly peer review procedure and their licensing policy.

8.3 COMPLIANCE CHECKING INFRASTRUCTURE

Within the more established OA journals space, compliance checking infrastructure such as the Plan S journal checker tool, and the SHERPA suite are available and help researchers find out what choices they have when it comes to various OA policies and compliance. Similar tools are not available for OA books, and converting the above-mentioned infrastructure services to address the specific needs and aspects of OA books is not straightforward.

To encourage and facilitate OA for academic books on an increasing scale, researchers would need supporting tools that help them to understand their choices in terms of policy compliance and publishing options.

8.4 HOSTING AND DELIVERY

For smaller publishers, it is challenging to find the best fitting hosting solution for their specific demands and at the same time meet all expectations in terms of metadata availability in various formats, given the growing number of available platforms. One of the emerging infrastructures, the COPIM project's work on open dissemination system, may support publishers on this front through its Open dissemination system deliverable.

8.5 DISCOVERY

OA books metadata degradation throughout the ebook supply chain is a central pain point affecting all stakeholders. While certain metadata standards and best practices on this exist (Pieper *et al.*, 2018; Snijder, 2016) there is a lack of community wide alignment to best practices for OA books.

Related to the first gap, libraries have trouble identifying OA books (OA tagging). A centralised location, housing high-quality and openly licensed Machine-Readable Cataloguing (MARC) records for all known OA materials, regularly updated and with easy download features is lacking. Large-scale metadata providers, such as Online Computer Centre (OCLC) WorldCat, incorporate OA publications, including OA books, but do not offer free or openly licensed metadata for OA publications, creating a financial barrier for some stakeholders. In addition, acquisition of full MARC records will come with licence restrictions on further dissemination. While DOAB does offer openly licensed metadata for all its OA books, these are of a basic standard, and do not always meet the (varied) local needs of libraries. The NBK provides a data foundation for a number of Jisc services for all UK universities and colleges that form a suite of products known as 'Library Hub'.

The existing ebook supply chain is built for paid access and incentives are therefore typically aligned for paid access. Existing – often commercial – intermediaries have a financial incentive for the print version to be discoverable for sale; this is not the case for the OA version of the same book. This holds back infrastructure improvements in terms of metadata and discoverability for the OA version of a book. A recent draft report by Clarke and Ricci provides further insight on this topic beyond the scope of this project (Clarke & Ricci, 2020). Often, this means that the OA version of a book is less discoverable than the print edition, leading to instances where a user may not be aware of the existence of an OA version of the print book they discover online.

For OA publishers, especially NUPs and Academic-Led Presses (ALPs), it can be challenging to work within the existing ebook supply chain – the channels that library acquisition departments use to buy print and ebook content.

8.6 PRESERVATION

There is limited attention for preservation of OA books. Two main issues around preservation for OA books concern the governance and the technical aspect of preservation.

In terms of governance, in practice it is often unclear who is responsible for the preservation of OA books. Both hosting platforms and publishers offer preservation through third parties (CLOCKSS and Portico), but for OA via deposit of the author's accepted manuscript in a repository, preservation is typically handled by the researcher and its institution through the institutional repository. Technical aspects are related to the varied and complex nature of OA books. They come in various formats (PDF, ePub, XML), hardcopy and may (increasingly) include embedded materials such as videos and 3D models.

These issues may in part be addressed through the COPIM project which, in partnership with the British Library, is investigating key technical aspects related to archiving research monographs. The COPIM project's main deliverables include effective technical methods for archiving, a set of recommendations for best practices around legal and copyright issues as well as a model enabling uptake of the methods by presses and libraries.

8.7 MONITORING AND MEASURING OF IMPACT

Funders, publishers, and other stakeholders often do not have a complete overview of the large and growing number of platforms where OA books are hosted. This leads to challenges when it comes to reporting on usage and impact data. Furthermore, usage data comes from a variety of platforms and is not standardised, making analysis and benchmarking of usage data a complicated task.

Project COUNTER and the COUNTER 5 standard for reporting on book usage addresses part of this challenge by providing a standard for usage reporting. The OAeBU data trust project[3] provides further context on some challenges within this area. For instance, COUNTER 5 leaves room for idiosyncratic platform decisions, making it more difficult to compare across platforms (e.g. around counting chapter usage and accounting for non-human access). Some OA book publishers tackle these complexities through a commercial service offered by Knowledge Unlatched (KU Open Analytics).

Practices and degrees as to what extent usage data around OA books is shared and with whom varies and general 'best practices' around the sharing of OA usage data are lacking. Together with the main OA book stakeholders, the OAeBU data trust project is seeking to address these pain points. These include further aspects beyond the technical components, such as a focus of institutions on institutional-usage and paid for content only.

For OA books particularly, institutional usage of non-paid (freely available) OA books and the global reach of publications stemming from the institution's researchers may also be considered of interest. A recent Springer Nature white paper (Pyne *et al.*, 2020) on how OA affects the geographical reach and readership of books examines this in further detail. Beyond usage and impact data, other metrics and information can contribute to demonstrate the importance of OA scholarship and its benefits for authors, publishers and institutions alike.

OA books often lack the metadata to connect them to research grants and OA publication funds. Funders registering grant DOIs with a service such as CrossRef seems fundamental to a lot of downstream analysis. If grants are consistently and uniquely identified, it makes it easier to link outputs resulting from funded activities to grants. Note that the CrossRef grant DOI metadata schema could record ROR organisational IDs for the

[3] The OAeBU draft report available at the time of writing provides further context (Clarke & Ricci, 2020). It is expected an eventual final report may expand upon these challenges and issues still.

organisation(s) receiving funding, project IDs for funded projects, ORCID IDs for investigators, etc. Additionally, having consistent, correct, and machine-readable licence metadata is important for gaining a better overview of the evolving OA books landscape. This data is invaluable for matching outputs to entities at the point of publication and afterwards during evaluation or reporting.

In general, there is insufficient monitoring of academic book output affecting all stakeholders. The lack of representation of academic books (including OA books) that feed into the CRIS/RIM systems that universities use to manage their REF reporting results in systematic underrepresentation of humanities scholarship. UKRI is in a position to raise awareness of this issue among research administrators.

8.8 OPEN ACCESS ENGAGEMENT AND ADVOCACY

There is lack of awareness among researchers of possibilities concerning OA book publishing. They lack insight in the opportunities that OA book publishing offers, how to get an academic book published in OA or the availability of support and infrastructure. Due to the lack of coordination of OA funding opportunities, it is also challenging to find funding to publish in OA. There is a lack of case studies on the benefits of OA books for authors, including success stories, lessons learnt, and what options authors have. Such case studies and stories would be important to engage authors. Operational since Autumn 2020, the OAPEN open access books toolkit, partially addresses some of these gaps from a general and global perspective.

Mechanisms for gathering qualitative data about OA book engagement to improve advocacy are hardly used. As part of the project 'Mapping the free ebook supply chain', Eric Hellman created an open-source survey tool that allows OA publishers to collect qualitative feedback (Watkinson, *et al.*, 2017). Open Book Publishers used this tool for a while and Michigan University Press uses a version as well. The data this tool brings back can prove useful to further OA book advocacy.

Though third-party rights are not considered part of the scope of this study, it should be noted that an infrastructure to help authors clear third-party rights for OA books (or other OA publications) at scale does not currently exist.

8.9 INTEROPERABILITY

The diverse nature of OA book publishing is reflected in the broad set of technical infrastructures currently supporting OA books. The shortcomings of metadata and standards for OA books limit interoperability.

Metadata linking, capturing and consistency between infrastructures remains an issue for all stakeholders within the OA book landscape. While PIDs are increasingly adopted for journal articles and its benefits for the research ecosystem become increasingly clear, it is critical that the adoption of PIDs for OA books needs to be further developed. To enhance interoperability, a stronger consensus around metadata standards, commitment to PIDs as well as best practices is needed.

Current information exchange concerning OA books between authors, publishers, funders and institutions is limited. There is a lack of interconnectedness between the various technical infrastructures resulting in limited information flows. A central hub connecting the different stakeholders and facilitating information exchange on OA books is missing.

The OA Switchboard, an initiative supported by the Open Access Scholarly Publishing Association (OASPA) is aimed at facilitating the fulfilment of OA business models and improving information exchange between authors, publishers, funders and institutions. The OA Switchboard promises to become a crucial infrastructure in the OA journals space. The technical design of the OA Switchboard allows it to be expanded beyond the journal space, through further development it could eventually cater to the specific needs of OA books.

9. RECOMMENDATIONS

9.1 INTRODUCTION

This chapter follows on from Chapter 8, Gap analysis, which outlines the gaps in the technical infrastructure. Here we attempt to answer Objective 4 of the Terms of reference for this project: identify ways in which UKRI and other stakeholders might consider supporting existing infrastructure, and how UKRI might address any gaps. The recommendations support the development of OA monographs generally, with a view to support implementation of UKRI's OA policy. The recommendations are, to a large extent, relevant for the broader stakeholder community and can be considered in the wider context of policy development and measures to improve the infrastructure for OA books, including the work done by Knowledge Exchange, the Horizon Europe program, and the intended inclusion of OA books in Plan S. A table at the end of this chapter, Overview of recommendations, includes an indication of which recommendations might be prioritised by UKRI for further consideration.

Before addressing specific identified gaps and recommendations, we suggest some overarching principles for technical infrastructures that support OA. These infrastructures should preferably:

- Be open and sustainable, as outlined in the 'Principles for open scholarly infrastructures' (Bilder *et al.*, 2015).
- Follow 'Good practice principles for scholarly communication services' (COAR & SPARC, 2019).
- Enable bibliodiversity, to support different business models and types of publishers.
- Interact in a seamless way, ensuring interoperability between systems, to provide a consistent and efficient ecosystem for OA books.

9.2 RECOMMENDATIONS

9.2.1 OPEN ACCESS ENGAGEMENT AND ADVOCACY

More can be done to provide reliable and comprehensive information and reach target audiences. There are several community initiatives that could be supported to improve their service and become more effective. Think, Check, Submit for books and the OAPEN OA books toolkit are aimed at authors and provide guidance in finding publishing venues and to support authors in the OA book publishing process, the NUP toolkit from Jisc will help institutions to set up and develop their publishing operation, and the Open Access Books Network has been launched as a central place for stakeholders and everyone interested in OA books to exchange knowledge and discuss all aspects of OA books. All these initiatives rely on volunteer work.

9.2.2 COMPLIANCE CHECKING

This is an important area especially for funders, and a clear gap for OA books. Experts and stakeholders – not including UKRI – are discussing the extension of the SHERPA services to OA books, and funders should consider a 'Books checker tool', following the example of the Journal checker tool provided by cOAlition S to authors to support them in finding Plan S compliant routes through which to publish their articles.

In addition, it should be noted that more needs to be done in related areas, such as support for authors to find funding opportunities and support for self-archiving:

- Authors are not properly supported to find funding opportunities for OA books, despite the efforts of many institutions and publishers. Funders should take the initiative to establish a separate resource to provide and maintain OA funding information from all funding sources.

- OA via deposit of the author's accepted manuscript in a repository is not well established for books or book chapters and may not become a realistic alternative for immediate open access of the final published version of a book. The OAPEN Foundation is preparing a consultation on this subject as part of an European Commission (EC) funded project with the European Research Council.

9.2.3 QUALITY ASSURANCE

There is a perception among many researchers that OA books are of lesser quality than traditional books, also that OA publishers are more often predatory than conventional publishers. There is no evidence to support that there is an issue with quality assurance for OA books, and this is a cultural issue rather than a gap in technical infrastructure, but it relates to a lack of transparency in quality assurance for monograph publishing in general (although not among all publishers). Infrastructure can play a role by improving transparency of quality assurance processes, which is relevant in the transition to OA. There are a few initiatives to improve transparency, including the OPERAS Certification Service for peer review practices which is being introduced by DOAB. Funders should support such initiatives. In the wider context of quality assurance, funders should promote or require transparency to improve awareness, change perceptions and support trust in OA books. In addition, the OA books community should promote best practice guidelines following the example of the 'Principles of transparency and best practice in scholarly publishing' for journals (Redhead, 2013) and subsequent work by Jisc and OAPEN, 'Publisher information on open access monographs' (Jisc & OAPEN Foundation, 2016).

9.2.4 MONITORING AND MEASURING IMPACT

To allow funders to gain sufficient insight into the effects of OA policies, they must be able to monitor the transition to OA by gathering data on funded research. Some consulted experts suggested that monitoring could be improved by introducing DOIs for research and publication grants and making use of DOI metadata schema to connect related PIDs. The use of PIDs should be promoted or required where appropriate. To gain control over metadata and increase the capacity to monitor OA books, it could be considered to aggregate OA books output (described further below). In addition, monitoring internationally could be improved by collaborative initiatives supporting a collaborative initiative suggested by Knowledge Exchange, the Open Book Watch. Finally, funders and other stakeholders such as publishers and libraries should support standardisation and best practices around usage metrics, such as the emerging OPERAS metrics service jointly operated by Open Book Publishers, Ubiquity Press and COARD, and the emerging infrastructure for data Exploring Open Access eBook Usage (OAeBU) funded by Mellon.

9.2.5 DISCOVERY

We consider discovery to be one of the most urgent issues around OA books, affecting the whole ecosystem. As mentioned above, this is to a large extent due to a lack of downstream 'coverage' of metadata, leading to libraries having trouble identifying OA books. In general, there is a lack of best practices, commitment to PIDs and metadata standards. The COPIM project is trying to improve dissemination through an Open Dissemination System (ODS). We expect that there will be synergies between this ODS and the established infrastructure DOAB. Stakeholders should support ongoing work in this area and wider implementation of project results. Finally, it is highly recommended to achieve data exchange and integration with the National Bibliographic Knowledgebase (NBK). The NBK and Jisc provide services that form a 'Library Hub'.

Apart from the already mentioned pain points regarding metadata, there are a few others that are not easily resolved:

- There is no generally accepted minimum set of metadata for OA books (an initial attempt was developed by Jisc and OAPEN (Snijder, 2016), see also (Pieper *et al.*, 2018)).

- There are several co-existing standards for metadata formats (ONIX for publishers; MARC21, MARCXML, KBART for libraries; CSV and JSON for other users).
- Metadata for OA books do not always follow the FAIR principles (GO FAIR, 2016).

9.2.6 HOSTING / AGGREGATION OF OPEN ACCESS BOOKS

There are no identified gaps in technical infrastructure for hosting and delivery, but there are some related pain points. One is that self-archiving or OA via deposit of the author's accepted manuscript in a repository for books, is not well established, as mentioned earlier. Another pain point noted earlier is a lack of interoperability regarding the integration of OA books in the existing ebook supply chain.

Aggregation of metadata and OA publications should be viewed as an opportunity for improvement in various areas, particularly for monitoring and measuring impact, and for discovery. Aggregation can take place at different levels, within UKRI for UKRI funded outputs (either the final published version of a book or the author's accepted manuscript deposited in a repository), at a national level through a national repository or platform, and internationally in partnership with OAPEN. There are various advantages, depending on the levels of aggregation. Aggregation will improve control over metadata, thereby supporting monitoring; it will facilitate further dissemination and integration with other systems, thereby improving discovery, and it can support research by improving full text search and re-use across collections.

9.2.7 PRESERVATION

Preservation of OA books is identified as a complex area, both from a technical and a governance perspective. Preservation of OA books should be addressed at a national and international level, in liaison with UK legal deposit libraries and international partners. The COPIM project is investigating the issues around OA books in partnership with the British Library. Another existing infrastructure which might be helpful as well is the Public Knowledge Project (PKP) which provides its PKP Preservation Network for Open Journal Systems (OJS) journals, which might easily be extended to books.

9.2.8 EMERGING INFRASTRUCTURE

Apart from emerging infrastructures already mentioned, there are a few others that deserve attention. The COPIM project is developing new models and infrastructure to support OA book publishing, both for pure OA publishers. What they have in common is that they provide a model for institutional funding. This is highly relevant for the transition to OA to be successful. The COPIM has pushed forward critical areas and further exploration and support may be required for sustainable change to enable wider adoption of these infrastructure components. Funders should support innovation in funding and business models and should explore how different funding sources can work together to support the transition to OA.

Another infrastructure which was launched only recently is OA switchboard. As this is based on metadata exchange between stakeholders, it has the potential to greatly improve the use of metadata, particularly PIDs. OA switchboard is not yet adapted to OA books, but it has been designed to include other output types and different business models. Funders should therefore support the inclusion of OA books.

9.3 OVERVIEW OF RECOMMENDATIONS TABLE

Table 20 Overview of recommendations, brings together the main technical infrastructure, the identified gaps and the recommendations. In the recommendations column on the right, the shaded text indicates recommendations that might be prioritised by UKRI, based on a first assessment of relevance from a funder perspective by the authors of this report.

Table 20 Overview of recommendations

*) Emerging infrastructures

Infrastructure area	Existing infrastructures & emerging infrastructures *	Identified gaps	Aims	Recommended actions *(highlighted: most relevant from funder perspective)*
OA engagement & advocacy	Think, Check, Submit OAPEN OA Books Toolkit New University Presses Toolkit Open Access Books Network (OABN) Open Access Tracking Project SPARC Europe OAPEN Directory of Open Access Books (DOAB)	Lack of awareness among researchers of possibilities concerning OA book publishing. Lack of infrastructure to help authors clear third-party rights for OA publications.	Help authors understand benefits of OA books and adopt OA. Help all types of publishers comply with OA requirements, supporting bibliodiversity.	Work with publishers to build case studies and success stories around OA books. Address issues of licensing, copyright, third party rights, re-usability. Support of community initiatives such as Think, Check, Submit and the OA Books Toolkit.
Quality assurance infrastructure	DOAB Certification Service*	Perceived lack of quality in OA books	Support trust in OA books. Transparency of peer review procedures.	Promote and where appropriate require transparency. Follow example of community initiative 'Principles of Transparency and Best Practice in Scholarly Publishing' for journals.
Compliance checking	OPERAS Publishing Services Portal* SHERPA Services for Books*	Lack of tools for OA books	Transparency of services.	Initiate / contribute to efforts to support authors to understand their options: to find funding opportunities, to comply with policies. Support development of 'Books Checker Tool' / SHERPA for books.
Monitoring & measuring impact	OAeBU data trust*	Missing metadata to connect OA books to research grants and publication funds.	Gaining insight.	Introduce DOIs for research and publication grants.

Infrastructure area	Existing infrastructures & emerging infrastructures *	Identified gaps	Aims	Recommended actions *(highlighted: most relevant from funder perspective)*
	OPERAS Metrics Service* IRUS-UK OpenAPC (OpenBPC) * Open Book Watch *	Lack of standardisation and best practices around usage data. Lack of representation of (OA) books in CRIS/RIM systems.	into effects of OA policy, into transition to OA books, into usage and impact of funded research.	Make use of DOI metadata schema to connect related PIDs. Integrate with NBK (data exchange). Support initiative to establish Open Book Watch. Support standardisation and best practices around usage metrics.
Discovery	DOAB The COPIM project's work on an open dissemination system Unpaywall	Lack of downstream 'coverage' of metadata (in particular PIDs and funding details). OA books metadata degradation throughout the ebook supply chain. Libraries have trouble identifying OA books (OA tagging).	Consistent, complete, open metadata	Align with national stakeholders and international partners. Take part in community initiatives to achieve further standardisation and best practices around metadata. Support DOAB as registry / discovery service. Support potential follow-up project of -Open Dissemination System.
Preservation	CLOCKSS Portico Public Knowledge Project (PKP) Preservation Network The COPIM project's work on Archiving and Digital Preservation (incl. the British Library) *	Technical challenge of preservation and ambiguity concerning who is responsible for the preservation of OA books.	Transparency of publisher solutions	Develop approach to preservation of OA books in liaison with UK legal deposit libraries and international partners. Take into account outcome of COPIM-WP7, Archiving and preservation
Hosting / aggregation	Think, Check, Submit OAPEN OA Books Toolkit NUP Toolkit OA Books Network	Self-archiving is not an established route for longform publications. Aggregation is an opportunity to improve monitoring, discovery, impact.	Requirements for deposit of OA books	Evaluate self-archiving / OA via deposit of the author's accepted manuscript in a repository with stakeholders. Consider national aggregation / national platform.

Infrastructure area	**Existing infrastructures & emerging infrastructures ***	**Identified gaps**	**Aims**	**Recommended actions** ***(highlighted: most relevant from funder perspective)***
	Open Access Tracking Project SPARC Europe OAPEN DOAB DOAB Certification Service* OPERAS Publishing Services Portal* SHERPA services for books*			Work with OAPEN as aggregator for funded OA books and deposits.
Interoperability	Growing number of platforms and institutional repositories	Lack of consensus around metadata standards, commitment to PIDs and best practices.	Use of PIDs	Support use of OA Switchboard for books.
Revenue management infrastructure	The COPIM project's work on revenue infrastructure and management Platform, and alternative business models *	(out of scope of gap analysis)	A variety of business and funding models, supporting a diverse publishing landscape	Engage in innovation around OA models.

10. LITERATURE REVIEW

This review lists recent literature on several subjects surrounding OA books, with additional older relevant titles.

10.1 OPEN ACCESS BOOKS: GENERAL

- **OA Books supply chain mapping - draft report.** This report is part of the Mellon-funded "Exploring OA ebook usage" project, to examine the flow of information across the still emergent supply chain for OA monographs. (Clarke & Ricci, 2020)
- **The state of open monographs: an analysis of the Open Access monograph landscape and its integration into the digital scholarly network**. (Grimme *et al.*, 2019)
- **Open access and monographs: evidence review.** This report brings together work carried out by the OAM Group over the last 12 months and reflects on the findings from Fullstopp GmbH's data analysis of OA books. (Universities UK Open Access Monographs Group, 2019)
- **The visibility of open access monographs in a European context: full report.** This report explores the extent to which OA specialist scholarly books can be seen by the communities that might make use of them. It also identifies the key challenges that will need to be tackled in order to ensure that OA books are fully integrated into digital landscapes of scholarship; as well as the steps that need to be taken to achieve this goal. (Neylon *et al.*, 2018)
- **The OA effect how does open access affect the usage of scholarly books?** This report presents a comparative analysis of usage data for OA and non-OA scholarly books published by Springer Nature, and provides an informed view of how a book benefits from OA publication. (Emery *et al.*, 2017)
- **OAPEN-NL; OAPEN-UK; OAPEN-CH.** Research on the effects of open access on monographs. (Collins & Milloy, 2016; Ferwerda *et al.*, 2013, 2018).

10.2 PUBLISHERS

- **Opening the future project at Central European University Press.** This project - part of Work Package 3 of the COPIM project - seeks to convert publishers to business models that will allow them to publish their books openly, without using unaffordable book processing charges. (Eve, 2020)
- **COPIM revenue models for open access monographs.** (Penier *et al.*, 2020)
- **Rebels with a cause?** The viability of new university and academic-led open access publishing, (Deville *et al.*, 2019)
- **Mapping the publishing challenges for an open access university press**. The article focuses on six key stages throughout the lifecycle of an open access publication: commissioning; review; production; discoverability; marketing; analytics. (Taylor, 2019)
- **OPERAS open access business models white paper.** (Speicher *et al.*, 2018)
- **Publication workflows for (open access) academic books** (Schrader *et al.*, 2018, 2020; Springer, 2017)
- **Changing publishing ecologies.** Report on the current landscape of NUPS and ALPs emerging within the UK. (Adema & Stone, 2017).

10.3 FUNDERS

- **Evaluating the impact of open access policies on research institutions.** How do funder mandates, institutional policies, grass-roots advocacy, and changing attitudes in the research community affect the open access performance of individual institutes? (Huang *et al.*, 2020)
- **Dutch Research Council (NWO): open access book funding policy.** (NWO, 2019, p. 1, 2020)

- **Briefing paper on open access to academic books.** (Science Europe, 2019)
- **The FWF's open access policy over the last 15 Years – Developments and outlook.** (Rieck, 2019)
- **Towards a roadmap for open access monographs: a knowledge exchange report.** open access for monographs is mandated by only a few funders, such as Austria (FWF), the Netherlands (NWO), Switzerland (SNSF), and the Wellcome Trust in the UK. However, in a rapidly evolving landscape, recent announcements concerning OA monographs policies in the UK and France have shown an increasing OA commitment for scholarly books across Europe. (Adema, 2019).
- **Critical issues in open access and scholarly communications.** (Kember, 2019)
- **Open access and monographs: where are we now?** (Rivington, 2018)
- **Cost estimates of an open access mandate for monographs in the UK's third research excellence framework.** (Eve *et al.*, 2017)
- **A landscape study on open access and monographs: policies, funding and publishing in eight European countries.** (Ferwerda *et al.*, 2017).

10.4 LIBRARIES

- **Increasing visibility of open access materials in a library catalogue: case study at a large academic research library.** (Edmunds & Enriquez, 2020)
- **National Bibliographic Knowledgebase (NBK).** The NBK provides a data foundation for a number of Jisc services that form a suite of products known as 'Library Hub'. (Grindley, 2020).
- **Opening up the library.** If we were to redesign our libraries around the premise of open rather than closed content, what would that look like? (Ball *et al.*, 2019)
- **LIBER 2019 Workshop. Open access books in academic libraries – how can we adapt workflows and cost management to an open scholarly communications landscape?** (Wennström *et al.*, 2019)
- **RLUK Strategy 2018-2021: reshaping scholarship.** (Cheung, 2018)
- **OA monographs discovery in the library supply chain.** (Stone, 2018).

10.5 AUTHORS

- **OAPEN OA books toolkit.** (OAPEN Foundation, 2020)
- **The future of open access books: findings from a global survey of academic book authors.** (Pyne *et al.*, 2019)
- **Example of author advice by UCL.** (UCL, 2019)
- **Innovations in scholarly communication.** Describing the workflow for researchers. (Bosman & Kramer, 2018)

10.6 METADATA AND IDENTIFIERS

- **Developing a persistent identifier roadmap for open access to UK research.** An idealized immediate OA of the final published version of a book workflow in which PIDs were used to ameliorate specific pain points. (Brown, 2020)
- **Ebook bibliographic metadata requirements in the sale, publication, discovery, delivery and preservation supply chain : a recommended practice of the National Information Standards Organization.** (NISO, 2020)
- **Research organization registry (ROR)**. A community-led project to develop an open, sustainable, usable, and unique identifier for every research organization in the world.(*ROR*, n.d.; Wilkinson, n.d.)

- **Transitioning to the next generation of metadata.** Expanding the use of PIDs in libraries. A long list of non-library sources that could enhance current authority data or could be valuable to link to in certain contexts has been identified. (Smith-Yoshimura, 2020)
- **Exploring WorldCat identities as an altmetric information source**. First analysis of WorldCat identities, part of the WorldCat global catalogue. (Torres-Salinas *et al.*, 2020)
- **A literature review of scholarly communications metadata.** This literature review of scholarly communications metadata lists stakeholders: publishers, service providers, researchers, funders, librarians, and data curators. It describes challenges, opportunities, gaps for each stakeholder. (Gregg *et al.*, 2019)
- **Can richer metadata rescue research?** Exploring the potential opportunities for the enrichment of metadata, the role of the metadata librarian and opportunities for all librarians to contribute. (Kemp *et al.*, 2018)
- **Qualitätsstandards für den einstieg in die open-access-stellung von büchern = Quality standards for getting started with open access provision of books.** Developed by the National Contact Point Open Access OA2020-DE, Knowledge Unlatched and transcript publishing house with the aim, to provide authors, publishers and libraries a practical guideline describing criteria for the production, distribution and financial participation in the open access provision of books. (Pieper *et al.*, 2018)
- **Metadata for open access monographs: A metadata model for open access monographs.** The model was created as part of the project 'Investigating OA monograph services', conducted by Jisc and OAPEN. (Snijder, 2016)
- **Guide to identifiers - explanation of identifiers**. (BISG Identification Committee, 2014)

10.7 USAGE DATA AND IMPACT MEASUREMENT

- **Open access books in the humanities and social sciences: an open access altmetric advantage.** OA facilitates extra attention and the apparent OA altmetrics advantage suggests that the move towards OA is increasing social sharing and broader impact. (Taylor, 2020)
- **Diversifying leadership through open access: a usage analysis for OA books.** What effect has publishing OA has on the geographic usage of 3,934 books published by Springer Nature? (Pyne *et al.*, 2020)
- **Engaging stakeholder networks to support global OA monograph usage analytics.** Can a global usage data trust can meet the needs of OA monograph creators, editors, publishers, publishing service providers, libraries and sponsors? (Drummond, 2020)
- **Exploring open access ebook usage.** (Hawkins & O'Leary, 2019)
- **The deliverance of open access books : examining usage and dissemination.** (Snijder, 2019)
- **Practices and patterns in research information management.** (Bryant *et al.*, 2018)

10.8 INFRASTRUCTURE

- **OA switchboard.** The OA switchboard enables funders, institutions and publishers to send and receive a defined set of standardised messages between them, ideally in an automated, integrated, and scalable manner. (*Home | The OA Switchboard Initiative*, n.d.; *OA Switchboard Initiative*, 2020)
- **Scoping the open science infrastructure landscape in Europe.** Report commissioned by SPARC Europe. (Ficarra *et al.*, 2020)
- **Next generation library publishing project.** (Ratan *et al.*, 2020)
- **COPIM WP5 scoping report: building an open dissemination system.** This report is commissioned by the COPIM project. (Stone *et al.*, 2020)

- **Bibliodiversity in practice: developing community-owned, open infrastructures to unleash open access Publishing.** (Barnes & Gatti, 2019; Boukacem-Zeghmouri & Berthaud, 2019)
- **Mind the gap: a landscape analysis of open source publishing tools and platforms.** (Maxwell *et al.,* 2019)
- **OPERAS common standards white paper.** What workflows, mediums and technical standards have recently emerged as a result of the changes brought about by the transition to Open Science? (Souyioultzoglou *et al.*, 2018)
- **OPERAS platforms services white paper.** The OA infrastructure is built as a "web of services" relying closely on each other and that the services cannot be considered independent of each other. (Mounier *et al.*, 2018)
- **OPERAS tools research and development white paper.** It describes writing, publishing, post publication PR among other subjects. (Gingold *et al.*, 2018)
- **Landscape study on open access publishing - Annex to OPERAS design study.** In the SSH, uncoordinated activities and lack of common standards complicate the transition to Open Science and OA publishing as standard practice. OPERAS as a model of distributed infrastructure for scholarly communication. (OPERAS Consortium, 2017)
- **Mapping the free ebook Supply Chain: final report to the Andrew W. Mellon foundation.** (Watkinson *et al.*, 2017)

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APPENDIX 1: IDENTIFIERS GROUPED BY TYPE

Identifiers play a key-role in enabling interoperability and integration between infrastructures and help streamline these processes. Several identifiers are being widely used today. Since different identifiers are used for different use cases, it is important to note that there is overlap between the assignment of unique identifiers to a single object. However, in many cases the organisations providing the identifier services coordinate their efforts and sometimes provide additional identifiers for the same object alongside their own (for instance, ORCID & ISNI - ROR & GRID, ISNI). The identifier groups are based on the report "Developing a persistent identifier roadmap for open access to UK research" (Brown, 2020).

- **People** - an identifier used for an individual, such as a researcher and authors.
- **Organisations** - an identifier used for organisations such as research-performing institutions, grant-giving organisations, and companies.
- **Publications** - an identifier used for an entity, such as a book, book-chapter, or any other publication form.
- **Research projects** - an identifier used for a research project.

For identifiers to work indefinitely, common challenges such as 'link-rot' and lost or corrupted information need to be tackled. So-called PIDs, address these issues and can be maintained in the long-term. While any web address (URL) can act as an identifier in the short term, web domains change, web sites are restructured, and URLs expire. PIDs are independent of these changes and can be used to manage them (Brown, 2020).

This appendix lists a set of commonly used identifiers in scholarly communications and related classifiers and guidelines that are relevant for people, organisations, publications, and research projects.

PEOPLE

- **ISNI** - An ISO certified global standard number for identifying the millions of contributors to creative works and those active in their distribution, including researchers (ISNI) - (ISNI, n.d.).
- **ORCID** - The ORCID iD is an https URI with a 16-digit number that is compatible with the ISO standard (ISO 27729) - (ISO, 2017), also known as the ISNI (ORCID) - (ORCID, 2019).
- **Scopus Author Identifier**. The proprietary Scopus author identifier distinguishes among similar names by assigning each author in Scopus a unique number and grouping all of the documents written by that author (Scopus Author Identifier) - (SCOPUS, n.d.).
- **SEMI.** When completed in December 2021, the Shared Entity Management Infrastructure will include easily accessible authoritative descriptions of works and persons, enhanced and managed by OCLC and the library community (SEMI) - (OCLC, 2020b).
- **VIAF.** The Virtual International Authority File (VIAF) service provides libraries and library users with convenient access to the world's major name authority files. All descriptions for a given entity are merged into a cluster that brings together the different names for that entity (VIAF) - (OCLC, 2019).

Also of interest:

- **WorldCat Identities** - A service that provides personal, corporate and subject-based identities (writers, authors, characters, corporations, horses, ships, etc.) based on information in WorldCat (WorldCat Identities) - (OCLC, 2020a).

ORGANISATIONS

- **Funder Registry -** The funder registry and associated funding metadata allows everyone to have transparency into research funding and its outcomes. It's an open registry of persistent identifiers for grant-giving organizations around the world; the medium-term plan is for the Funder registry to be replaced by ROR (CrossRef) - (Meddings, 2020).
- **GRID** - Global research identifier database (GRID) is a free and openly available global database of research-related organisations, cataloging research-related organisations and providing each with a unique and persistent identifier (GRID) - (Digital Science & Research Solutions, 2020).
- **IP Registry**. The IP registry is a proprietary repository of the validated IP addresses for over 70,000 content licensing organisations worldwide (IP Registry) - (IP Registry, n.d.).
- **ROR** - ROR is a community-led project to develop an open, sustainable, usable, and unique identifier for every research organization in the world (ROR) - (*ROR*, n.d.).
- **Ringgold** - The proprietary Ringgold identifier is a unique numerical identifier applied to organizations in the scholarly supply chain (Ringgold) - (Ringgold, n.d.).

PUBLICATIONS

- **DOI** - A Digital Object Identifier is a persistent identifier or handle used to identify objects uniquely, standardized by the International Organization for Standardization (ISO) - (ISO, 2017)

Also of interest:

- **ISBN** - An ISBN is essentially a product identifier used by publishers, booksellers, libraries, internet retailers and other supply chain participants for ordering, listing, sales records and stock control purposes. The ISBN identifies the registrant as well as the specific title, edition and format (ISBN) (International ISBN Agency, 2014).
- **ISSN** - An International Standard Serial Number (ISSN) is an eight-digit serial number used to uniquely identify a serial publication, such as a magazine (ISSN) - (CIEPS, n.d.).

RESEARCH PROJECTS

- **RAiD** - An identifier for research projects and activities. It is persistent and connects researchers, institutions, outputs and tools together to give oversight across the whole research activity and make reporting and data provenance clear and easy (RAiD) - (RAiD, 2019).

Also of interest:

- **OpenAIRE Guidelines** for Literature Repository Managers, Chapter 4. Funding Reference (MA) (OpenAIRE, 2018)

APPENDIX 2: REVENUE MODELS

The financial support for open access monographs, edited works and book chapter infrastructures are not be discussed extensively in this report. A recent COPIM report by Penier *et al.* (2020) contains detailed information on revenue models.

This appendix – which is based on the COPIM report – summarises the possible revenue models.

EARNED REVENUE MODELS

Those who use this model conduct activities, provide services, or sell items for which a fee is charged to generate revenue. Within this classification, the COPIM report distinguishes between advertising, book processing charge, cross subsidies, crowdfunding from individuals, embargoed/delayed OA, endowments; fundraising (donations and grants), hybrid (digital-only freemium); hybrid (print) and third-party licensing.

EMBEDDED INSTITUTIONAL SUPPORT

Organisations that enjoy embedded institution support are financed through a subsidy from its parent organisation, such as a university, university library, research centre or institute association. This model also includes in-kind support, which could be in the form of professional services provided – think of human resources, finance, IT, marketing and communications, library staff, and scholarly communications services – or the use of an institutional repository as platform. The COPIM report acknowledges library-based publishing and a subsidy model.

THIRD-PARTY SUBSIDIES

Here grants are provided from external stakeholders (commercial and not-for-profit organisations). The COPIM report describes grants and liberation.

CONSORTIAL MODELS

This type of model is based on the funding by many stakeholders without direct service provision. The COPIM report has subdivided this category into Library crowdfunding, Membership fees, Shared infrastructure and Subscribe-to-open.

APPENDIX 3: LIST OF ACRONYMS

ALP - Academic-Led Presses. A publishing initiative set-up and run by academics. Academic-led presses are most often independent, highly ideological entities, set up to provide an alternative publication route to the commercial presses or to support the open access publishing of books for example.

CLOCKSS – CLOCKSS provides a sustainable dark archive to ensure the long-term survival of Web-based scholarly content

COARD - Collaborative Open Access Research and Development. COARD develops and applies technology and analysis tools that provide insight into the usage and impact of open access scholarly content. COARD is the trading name of Knowledge Unlatched C.I.C., founded by Dr Frances Pinter in 2012.

COPIM – Community-led Open Publication Infrastructures for Monographs (COPIM) is an international partnership of researchers, universities, librarians, open access book publishers and infrastructure providers. It is building community-owned, open systems and infrastructures to enable open access book publishing to flourish.

CORE - A not-for-profit service delivered by The Open University and Jisc providing a unified search of repository content (OA research papers).

COUNTER – COUNTER provides the standard that enables the knowledge community to count the use of electronic resources. Known as The code of practice, the standard ensures vendors and publishers can provide their library customers with consistent, credible and comparable usage data.

DOAB – Directory of Open Access Books. DOAB is a digital directory of peer-reviewed OA books and OA book publishers. The primary aim of the service is to increase discoverability of OA books so that they can reach a broader audience. All publishers included in DOAB are screened for their peer review procedures and licensing policies.

DOI – Digital Object Identifier. A digital object identifier is a persistent identifier or handle used to identify objects uniquely, standardized by the International Organization for Standardization.

E-Pub – A format for ebooks

IRUS-UK – Institutional Repository Usage Statistics (UK). National aggregation service, which provides COUNTER-conformant usage statistics for all content downloaded from participating UK institutional repositories.

Jisc – A UK higher, further education and skills sectors' not-for-profit organisation for digital services and solutions.

KU – KU makes scholarly content freely available to everyone and contributes and contributes to the further development of the Open Access (OA) infrastructure. Its online marketplace provides libraries and institutions worldwide with a central place to support OA collections and models from leading publishing houses and new OA initiatives.

LOCKSS - Lots of Copies Keeps Stuff Safe. An approach to preservation based on a network of preservation partners.

MARC records – Machine-Readable Cataloging (MARC) record. MARC standards are a set of digital formats for the description of items catalogued by libraries, such as books.

NBK – National Bibliographic Knowledgebase, a project to collect catalogue data from more than 225 academic and specialist libraries. It is now offered as Jisc library hub services - discover, compare and cataloguing.

NUP - New University Presses, a term used for a new wave of university presses offering open access, digital first, library-based publishing, often used alongside Academic-led or Scholar-led presses.

OA – Open Access

OABN – The Open Access Books Network, https://hcommons.org/groups/open-access-books-network/. A space for anyone interested in OA books, begun by OAPEN, OPERAS, ScholarLed and SPARC Europe.

OAeBU - Open Access eBook Usage. A Mellon funded pilot to develop a Data trust for usage data.

OAPEN – The OAPEN Foundation works with publishers to build a quality-controlled collection of open access books through the OAPEN Library, and provides services for publishers, libraries and research funders in the areas of deposit, quality assurance, dissemination, and digital preservation.

OASIS - Open Access Scholarly Information Sourcebook (OASIS), https://www.copyright.com/learn/media-download/open-access-scholarly-information-sourcebook-oasis/. An authoritative 'sourcebook' on Open Access, covering the concept, principles, advantages, approaches and means to achieving it

OASPA – Open Access Scholarly Publishing Association. A membership organisation setup to represent the interests of OA globally in all scientific, technical and scholarly disciplines.

OATP – Open Access Tracking Project. is a crowd-sourced social-tagging project running on free software to capture news and comment on open access to research. Its mission is (1) to create real-time alerts for OA-related news and comment, and (2) to organize knowledge of the field, by tag or subtopic, for easy searching and sharing.

ONIX – Online Information Exchange (ONIX). ONIX is an XML-based family of international standards intended to support computer-to-computer communication between parties involved in creating, distributing, licensing or otherwise making available intellectual property in published form, whether physical or digital.

Open Access Books Toolkit – a free-to-access resource that aims to help academic book authors to better understand open access book publishing, and to promote and increase trust in open access books. The toolkit may also be of use to stakeholders including publishers, universities, research funders and research institutions. It is hosted and maintained by OAPEN.

OpenAPC – The OpenAPC initiative collects and disseminates datasets on fees paid for open access publishing on GitHub under an open database license. It aggregates data on Open Access journal articles (APCs), Open Access Books (BPCs) and data on articles published under transformative agreements. All data is provided voluntarily by universities and other HEI, funders or national consortia.

OpenDOAR - A quality-assured, global Directory of Open Access Repositories, provided by Jisc.

OPERAS – OPERAS is the Research Infrastructure supporting open scholarly communication in the social sciences and humanities (SSH) in the European research area. Its mission is to coordinate and federate resources in Europe to efficiently address the scholarly communication needs of European researchers in the field of SSH.

ORCID – Open Researcher and Contributor ID (ORCID). The ORCID ID is an https URI with a 16-digit number that is compatible with the ISO Standard (ISO 27729) also known as the ISNI.

PID – Persistent Identifier. A persistent identifier is a long-lasting reference to a digital resource. Typically, it has two components: a unique identifier; and a service that locates the resource over time even when its location changes. The first helps to ensure the provenance of a digital resource (that it is what it purports to be), whilst the second will ensure that the identifier resolves to the correct current location.

ROR – Research Organisation Registry. A community-led project to develop an open, sustainable, usable, and unique identifier for every research organization in the world (ROR ID)

ScholarLed – A consortium of five Academic-led not-for-profit book publishers.

SHERPA – a set of services to support authors and institutions with decisions in open access publication and compliance, provided by Jisc.

UKRI – UK Research and Innovation.

XML – Extensible Markup Language (XML). XML is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.