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The Road to Publication Cost Transparency

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2

JOIN² and openCost

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Abstract

Founded more than ten years ago, the JOIN² collaboration [19] brings together eight research institutions for the development and operation of a full-fledged shared scholarly publication database and repository based on the Invenio open source framework for large-scale digital libraries. Preferring simplicity to complexity one of our corner stones is to build on well-defined workflows. This enabled JOIN² to extend its services from representing the scholarly output of the member institutions to serve as the Open Access repository on site and gradually add additional services. One of these is the management of publication costs data alongside the publications within the repository. From the start we headed to model all costs we came across in scholarly publishing, be it open or closed access, to further cost transparency. This naturally led JOIN² to be one of the core members of openCost, with the Deutsches Elektronen-Synchrotron DESY representing the collaboration.

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2.1 Who is JOIN²?

JOIN² is an acronym for **J**UST AN**O**THER **I**NVENIO I**N**STANCE **TO JOIN**. As the spoken word suggests, the project invites to become part of a collaboration that jointly works on the challenges arising in practical life[3].

Originally, JOIN² [19] was founded in 2010 by the libraries of Deutsches Elektronen-Synchrotron DESY, Forschungszentrum Jülich and GSI Helmholtzzentrum für Schwerionenforschung to replace existing solutions for publications databases and repositories [20, 21]. Over the years the JOIN² collaboration grew, and beyond the initial partners now also comprises[4] Deutsches Krebsforschungszentrum DKFZ (Heidelberg), Deutsches Zentrum für Neurodegenerative Erkrankungen DZNE (Bonn), Maier-Leibnitz-Zentrum (Garching), Museum Zitadelle (Jülich)[5] and RWTH Aachen University [22]. Figure 2.1 gives a map of all partners and associated laboratory sites that use JOIN² in Germany.

The institutional repositories maintained by JOIN² [22, 23] aim to serve multiple requirements, combine different applications in one system, and offer easy-to-use solutions suitable for everyday business (see e. g. [24–27] for an overview). They are intended to handle any kind of scientific literature and strategically foster Open Science. In addition to the collection and exposition of the scientific results of an institution, functioning as a publications database [25], a protected workspace for scientists has also been created [28, 29]. Publications and other resources can be exchanged and shared for various purposes, and the attachment of full texts is explicitly encouraged. Structured exports allow the reuse of the bibliographic data for upcoming publications or feed the publication list on the web. The integration with literature management tools and complex output filters, which are essential for reuse in the publishing process, also serve evaluations and budgeting of the administration, all operated via one common system. A detailed and constant requirement review of the metadata as well as the established authority control [30, 31] are important preconditions. The high quality of metadata even enables some partners to run their library system within their JOIN² instance [32].

[3] Using a very pragmatic approach to solve the problems at hand, the collaboration intitially did not even have a name. This was only estbablished in 2015 as more parters joined the project.

[4] As a result of the war of Russia against Ukraine, the membership of the Joint Institute for Nuclear Research, JINR (Dubna, Russia) is suspended.

[5] This instance uses JOIN² only for their library catalogue and does not contribute to the subsequent discussion.

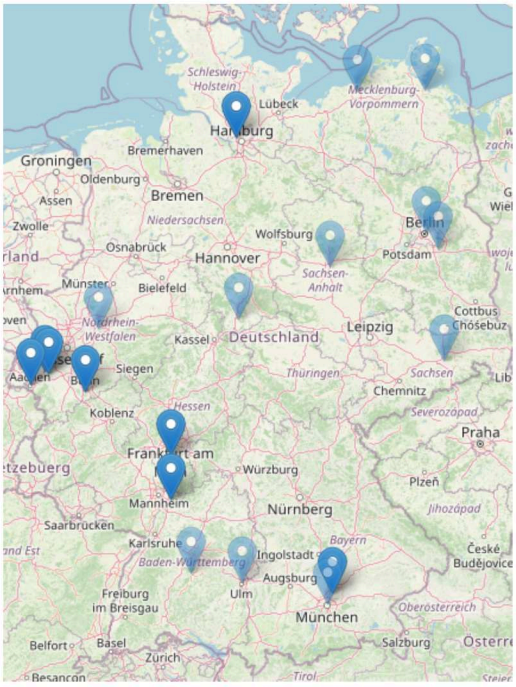

Figure 2.1: German partners of the JOIN² collaboration as of 2022: The dark dots mark locations where an instance is in operation, the shaded ones mark laboratory sites associated with the partners that also use one of these services. E. g. DESY operates PUBDB in Hamburg, but has a second laboratory in Zeuthen near Berlin.

In 2022 JOIN² provided service to more than 23.000 staff members. More than 6.000 visiting scientists also use the services e. g. to report their achievements. In total, the running instances provided more than 609.000 bibliographic records, where more than 98.000 also offer a full text available in Open Access. Additionally, if licencing restricts the supply of the full text, for a large number of articles the bibliographic records hold pointers to other repositories (e. g. Pubmed Central [33] or arXiv [34] etc.) where the full text is available.

Besides bibliographic data the JOIN² infrastructure shares nearly 147.000 authority records [30, 31] to ensure the high quality of the metadata provided plus a number of author authority records individual to each instance[6]. With

[6]To give an idea at DESY these are currently more than 44.000 additional records, while at RWTH Aachen University more than 210.000 internal authorities are required.

the sole exception of the author records, all these records are freely discoverable and available via OAI-PMH [16] in MarcXML. With the Karslruhe Institute of Technology (KIT) we know at least one larger non-JOIN²-partner that reuses those records for its own systems.

Technically, JOIN² is based on INVENIO [35], a software developped for large scale repositories by CERN. JOIN², however, was customized to add some features not found in INVENIO. A flavour of Marc21 (expressed in XML) is used as internal data format allowing for very rich metadata. Additionally, while every project partner operates its local installation, the project established a common code base and regular roll out procedures to keep all parterns up to date [36]. This also allows for developments, once implemented, to be used by all.

2.2 Publication Costs: Symbiosis of JOIN² and openCost

JOIN² relies on a jointly developed and constantly reviewed, as well as expanded, infrastructure. Together we work on codes, rollouts, configurations, and share our individual expertise. The following section will depict which implications and workflows regarding data acquisition, provision and internal evaluation are to be considered to organize the publication costs mangement and monitoring of JOIN². The development JOIN² has experienced till today's handling will be illustrated, accompanied by a description of what openCost [37] implies for JOIN² and what the prospects are for strategic further development in the future.

Pretty early on, JOIN² realized that the handling of publication charges, both Open Access as well as Closed Access, are a central service that libraries have to provide [38]. Especially the research centres in JOIN² have a long tradition in this regard stemming from the reprint-era, where reprints, like other literature material, were centrally acquired and managed by the libraries via a dedicated budget. Those budgets usually form the core of the publication funds established decades later.

With the rise of APC funded Open Access it was further realized that a centralized management and monitoring is required, and that a repository, especially if it offers a rich data model and high quality metadata like JOIN², is a natural place to manage these budgets [39–41]:

- In JOIN² the repository is usually *also* used for evaluations, hence scientists have to report their publications and a major goal is *completeness* with regard to the yearly scientific output (see also [39]).

  Bluntly put: If an institution spends an amount of money as for a publication to appear, and then fails to report this very publication as its own achievement, the workflow needs improvement. Hence it makes sense to handle charges centrally at the point that is also responsible for the bibliography and think both requirements as two sides of the same coin [39].

- Some institutions require a dedicated approval process *before* a publication is handed in. Starting this already in the repository/publications database again helps to ensure completeness and avoids the necessity to key in the data multiple times. As such an approval would require at least the preprint this also offers a good chance for Green Open Access later on.

- If a publication is bought by the library and hence is available under a free licence it should be available at the institution via the repository as well.

  - From a user's perspective one should find the article attached without any further forwarding to some publisher site to search there again for the download option.
  - Full texts further the visibility of the repository and hence the institution in search engines.
  - The institution should always have an archival copy.
  - The fine grained metadata available due to other requirements (e. g. reporting) is useful for the monitoring of costs.

- The usual repository infrastructure, like the OAI-PMH [16] interface, is readily available and can be used to make payment data available and visible and thus further transparency. This also ensures a seamless and fast possibility to share and reuse data.

- To store cost data along with publication metadata ensures consistent allocation of costs at the origin using the invoice as source.

  Our approach thus differs from the proposal of e. g. subsection 6.6.1 and avoids issues with assigning sums to items later on as outlined in e. g. subsection 6.1.2.

To maximise the insights from initiatives like OpenAPC [15] or the Open Access Monitor [42] however, the association of costs to the item are mandatory.

- As the cost data is stored together with the original article at the institution that handled (at least one of) the invoice(s), it is clear from the start who paid what. This avoids the difficulty of identifying the paying institution from the beginning. (For those challenges see section 5.2).

  One should note however, that models like SCOAP³ [6] still pose problems in this association as there is no single institution paying.[7]

Similar conclusions as in JOIN² were drawn independently at the University Library of Regensburg at about the same time (see also chapter 1 for the current status there). Discussions with OpenAPC as a natural user for exposed cost data finally led to a proposed infrastructure [43, 44] already in 2017 that will finally be realized in openCost [37, 45].

At JOIN² a simple module to add cost data to publications was implemented in about 2016 [40]. This was initially led by Forschungszentrum Jülich, but quickly adopted by DESY and other partners later on. Also triggered through requirements of the Helmholtz Association, represented by JOIN²-partners involved, as well as to replace and satisfy further local solutions [46].

JOIN² uses a very pragmatic approach, much in line with the findings of section 7.5. We try to add

- a minimal amount of additional data (namely cost-related values)
- at the point of their creation (namely the invoice)
- in a step that needs to be done anyway (namely, the clearing of the invoice by the library)
- *before* this invoice goes to central accounting.

Thus, within the JOIN²-approach cost data is collected at the time they are incurred, using the invoice as the source and not, for example, aggregations from the accounting system or further finance divisions of the individual institute. In this sense it differs from AT2OA2's description in subsection 6.6.1, relying on SAP as resource.

[7] In the context of monitoring the DFG program "Open Access Publikationskosten" [1, 14] this becomes quite apparent.

It is worth noting that the so called APC Module [40] of JOIN² always handled data well beyond Gold OA fees. Almost all normalized inputs are configurable to enable the system to handle whatever we come across, as we always wanted to cover all costs paid [38]. Hence it always contained categories like color charges hybrid OA, cover carges, costs for reprints, permissions (licencing fees) or page charges.

For monitoring JOIN² relies on metadata that were already added to the repository to describe the bibliographic item. Due to the high amount of automatic normalization in the submission process and the use of the repository also for research assessment, evaluations can be done on detailed aspects without the need to extract data from systems that have nothing to do with bibliographic information or where sums first need to be split to individual items by complex and error prone logics.

On the technical side all publication charges are handled like a book purchase. That is, owing to the Marc21 internal format, JOIN² adds pretty much the same Marc holdings block as it is done in a library system. The sole difference is, that the item is defined as the bibliographic entity just described, while each holdings block refers to a part of the individual payment. This allows to hold partial cots as shown on the invoice while a traditional holdings entry would only contain the overall sum. Figure 2.2 shows a cost block for a publication with four identifiable cost categories. Note that the Colour charges are in the same order of magnitude as the (hybrid) publication fee.

All other necessary metadata (see e. g. section 1.6, or [12]) are already stored during the submission to the repository and are thus readily available. The definitions for the necessary cost elements were done in close collaboration with those colleagues who actually handle the invoices. In other words *"What do you see on the bill?"*[8] is the key guiding question still frequently asked when adoptions for changes are required (e. g. transformative agreements).

In addition, for those colleagues involved in the collection and entering of cost data into the repository, the Electronic Journals Library [47] serves as a substantive frame of reference. The data in EZB is acquired by a cooperative effort (see section 9.3) and builds one corner stone of JOIN²'s journal identification system. As additionaly values are required, JOIN² explicitly supports the functional expansion of the EZB, intended within the framework of openCost in order to also provide information on the publication status in the future.

[8] now expanded by *"What does the dashboard show you?"*

```
876 7_  |c 1194.99
        |v 11.16
        |e Colour charges
        |d 2022-04-22
        |j Zahlung erfolgt
        |p 448457
        |9 2022-04-08
        |z additional figures
876 7 _ |c 32.16
        |v 0.30
        |e Other
        |d 2022-04-22
        |j Zahlung erfolgt
        |p 448457
        |9 2022-04-08
        |z payment processing fee
```

```
876 7_ |c 2050.15
       |v 19.14
       |e Hybrid-OA
       |d 2022-04-22
       |j Zahlung erfolgt
       |p 448457
       |9 2022-04-08
       |z CCBY license
876 7_ |c 597.49
       |v 5.58
       |e Colour charges
       |d 2022-04-22
       |j Zahlung erfolgt
       |p 448457
       |9 2022-04-08
       |z first figure
```

Figure 2.2: This cost block (slightly shortened internal format) shows four parts of a single invoice. As indicated by the fee type Hybrid-OA the article in question was published in a (at time of payment) hybrid journal. Besides the Hybrid-OA fee, the publisher also billed Colour charges twice: For the first figure 597.49 EUR +VAT and another 1194.99 EUR +VAT for all subsequent figures. Additionally, 32.16 EUR were charged for payment processing (payment processing fee). The orignal payments (not visible here) were done in USD and only later converted by means of the central accounting to EUR. (Note: The complete cost block also features some internal values, like the link to central accounting, budgets charged etc..)

In a first step journal categories as outlined in subsection 9.5.2 will allow JOIN²'s journal records to know the category of a journal in question (e. g. to identify mirror journals). This streamlines fee processing as certain budgets are only availabe for some given categories.

In the transition phase towards the *Open Access default* transformative agreements play a special role. As these agreements usually consist of a large number of ever changing individual journals. A simple interface that can be queried using journal identifiers (ISSN-, ZDB- or EZB-IDs are used extensively in JOIN²) and returns if the journal in question is subject to some contract and whether one's institution has subscribed to that contract has been a long standing desideratum, that basically exists at least since the very first DEAL agreement with Wiley. Hence, the ideas outlined in subsection 9.5.3 will ease up things for the staff considerably.

Even in a world where transformative agreements are a thing of the past, a service that returns information on specific agreements (currently misnamed 'memberships') will be a standing requirement and again the ideas of subsection 9.5.3 could come to the rescue.

At the moment this information is kept in internal lists which is cumbersome and error prone compared to a community created and curated database. Once the EZB eventually adds a Web-API providing this information upon request by some ID, changes will show up seamlessly within the JOIN²-systems. Combined with the glossary that EZB is about to build up, the currently ambigious definitions can be sorted out and repository staff will have a reliable source of information and a central point of reference for identifying the journals status at hand. This is further improved by the central data handling envisioned.

For the provision of JOIN²'s publication costs data an XML exchange format is utilized, which is to be adapted continuously to the current openCost version. An intermediate version can be seen in detail in Figure 2.3. The cost schema, that is based on a controlled vocabulary, is structurally capable of covering multiple fee types as well as multiple fee entries, different currencies and several identifiers. Always with the central focus on automatic data exchange, the repositories allow the provision of cost data in a machine-readable form for harvesting via the OAI-PMH interface [16, 48].

Besides the continuous implementation of the future openCost standards, JOIN² is facing further steps to be realized. Taking up the headings of harvesting and automated data exchange, all JOIN²-partners will be able to deliver their data to OpenAPC or provide it to all other interested parties in the future. The current process of manually creating tables and sending them in by mail did not work

```
<oc:publication>
 <oc:amounts_paid>
  <oc:item>
   <oc:amount_invoice currency="USD">4215.0</oc:amount_invoice>
   <oc:amounts_paid>
    <oc:amount_paid currency="EUR" type="hybrid-oa">2050.15</oc:amount_paid>
    <oc:amount_paid currency="EUR" type="vat">19.14</oc:amount_paid>
    <oc:amount_paid currency="EUR" type="colour charges">597.49</oc:amount_paid>
    <oc:amount_paid currency="EUR" type="vat">5.58</oc:amount_paid>
    <oc:amount_paid currency="EUR" type="colour charges">1194.99</oc:amount_paid>
    <oc:amount_paid currency="EUR" type="vat">11.16</oc:amount_paid>
    <oc:amount_paid currency="EUR" type="other">32.16</oc:amount_paid>
    <oc:amount_paid currency="EUR" type="vat">0.30</oc:amount_paid>
   </oc:amounts_paid>
   <oc:date_paid>2022-04-22</oc:date_paid>
   <oc:publisher>Soc.</oc:publisher>
   <oc:invoice_number>448457</oc:invoice_number>
  </oc:item>
 </oc:amounts_paid>
 <oc:oa_status>hybrid</oc:oa_status>
 <oc:primary_identifier>
  <oc:doi>10.1364/OL.448457</oc:doi>
 </oc:primary_identifier>
 <oc:secondary_identifiers>
  <oc:id type="local">PUBDB-2021-04978</oc:id>
  <oc:id type="oai">oai:bib-pubdb1.desy.de:472306</oc:id>
  <oc:id type="doi">10.1364/OL.448457</oc:id>
  <oc:id type="doi">10.3204/PUBDB-2021-04978</oc:id>
 </oc:secondary_identifiers>
 <oc:type>journal article</oc:type>
 <oc:institutions>
  <oc:institution type="short_name">desy</oc:institution>
  <oc:institution type="ror">https://ror.org/01js2sh04</oc:institution>
 </oc:institutions>
</oc:publication>
```

Figure 2.3: Sample record of Figure 2.2 expressed in an early version of openCost XML.

well due to limited resources.

The management in a JOIN² repository furthermore enables local Open Access publishing, if possible (Green Road). With cost transparency as one of the central goals of the Open Access transformation, the described efforts are now gaining importance beyond one's own institution with reporting for the DFG Open Access Publication Costs program [14]. Meeting the funding requirements thus often becomes a first intermediate goal on the way to openCost. It is worth noting that the current layout of cost handling in JOIN² already fulfills all requirements of this program and enabled an almost automatic creation of the monitoring table already for the first round of this program. In addition to certain challenges, this program also offers some project partners the first opportunity to establish the structural adjustments they have long been striving for. In this respect, the JOIN²-partners are also seeking to further enhance their monitoring.

Given the diverse partners JOIN² will provide an ideal testing ground within openCost and serve as a reference frame. Regular user meetings generate, scrutinize and review the results generated in openCost and subject them to practicality. In this way, openCost benefits from the discourse of the participating institutions, which test the initial project results in their own practical world and exchange experiences. The JOIN² repositories, along with those of the university libraries of Regensburg and Bielefeld, are thus the first to actively implement the openCost standards.

Moreover the automized reporting, including non Open Access fees, should be improved. How to optimize workflows and advance centralization will be an ongoing part of the debate. In this regard, the developments of the Transform2Open team (see e. g. [49] and chapter 8) in particular will be expected with great interest. With openCost heading for the more technical part and Transform2Open diving into workflows both projects are complementary and JOIN² expects quite a few synergies.

2.3 Organizational Challenges & Library's Engagement

2.3.1 Central Invoicing

A common goal in JOIN² is cost transparency within and between institutions that should be improved to enable comparisons and raise awareness of publication costs in general as well as the various components these charges are consisting of. To promote this, central invoicing is required.

It is thus a joint objective that the library assumes responsibility for publishing costs and centrally manages the entire process of publication charge handling. It should form a one-stop-shop for the researchers on campus. It is a common misunderstanding that this requires one single central fund to be the only source for payments. In fact, various budgets may be eligible for a single publication, so our view is in line with section 1.5 (see also the figure in [39], p. 17 for a very early view).

For example at DESY the library currently pays all Open Access charges via its own budget. But the library of course also handles publication charges related to Closed Access (e. g. colour charges, cover charges) or hybrid Open Access (also beyond so called transformative agreements). However, those costs are not covered by the library budget, but are charged to the budgets of the originating groups on campus. In these cases the library is a service facility for the processing. Once the invoice is checked by the library the costs are charged by the library to the cost centres accordingly, which also allows for inner-institutional cost splitting, e. g. depending on the cost type or the availability of third-party funding (e. g. in case of EU funded research). That is, while all invoices are handled centrally by the library, the actual budgets charged may belong to individual institutes on campus, central funds or third-party funding or a combination of all of those. In view of the current German DFG project Open Access Publication Funding [14] one can easily envision some amount to be charged to the publication fund, some amount to the program's cost centre and some non-OA-related charges (e. g. cover charges) to an institute's budget.

2.3.2 The repository

The JOIN² partner institutions [22] are working collaboratively on their approach to manage publication costs and there is a common understanding to use the repositories to this end for the reasons outlined in section 2.2. However, the precise organization for the handling of costs and internal workflows differs sometimes considerably, e. g. with regards to:

Figure 2.4: The road to openCost: In JOIN² the process to implement publication charge handling is at quite different stages. While Forschungszentrum Jülich is already rather advanced, delivering data (manually) to OpenAPC for some time now and being responsible for the DFG monitoring [1], other institutions are about to build up processes just now. At GSI and DFKZ the DFG Program Open Access Publication Funding [50] is a starting point to build up those structures. A few already hold cost data for years. Sometimes, however, those are not reflecting all publications due to decentralized processes.

- current status of publication costs handling on site (see also Figure 2.4)
- data acquisition, or "Who is actually handling the invoice?"

  To gain the most of the integrated workflow, it is common to handle it in the group responsible for scientific publishing, but sometimes it is done by the acquisition department.
- monitoring (similar to data acquisition)
- funding (central, decentral, dedicated funds, …)
- funding criteria (e. g. corresponding authors)
- number of personnel (the "group" may consists of only half a position)

Even though the outset in each library is quite different the experiences over the past years also show that there are quite some similarities. They may just not

be visible at first glance. It was also observed that some procedures that initially were handled differently converged over time to some best practise approach. For example, even though almost all parameters of the mentioned APC module (see section 2.2) are configurable and initially showed several different readings, over time they basically converged to the same set of values.

As many of the Helmholtz libraries are comparatively small while at the same time their institutions are very productive in research output, streamlining the overall process to improve efficiency is always a guiding principle and good enough may be better than perfect but unmanageable (see also section 7.5). Getting the library on board early on has several advantages in this regard, even for the library:

- It gives the opportunity to assist with author rights, copyright and licensing questions or implement measures against predatory publishing, e. g. as an outlet for results from SP4 of subsection 6.1.4.
- It offers the possibility to avoid unnecessary costs, e. g. by pointing at a Green OA option instead of expensive Hybrid OA to fulfill funders' requirements.
- The library can not only provide clarification for authors, but also optimizes and ensures compliance with or feasibility of the guidelines presupposed by the own institution or funders.
- It allows to inform authors on campus seamlessly about the payment (status, amount etc.).
- Usually, it ensures that the invoices are correct in the first place and the necessity to ask for corrections is reduced (e. g. VAT handling, billing address, special regulations due to a contract the authors are unaware of while the library is managing them).
- The library staff just processes *way more* invoices by many more different publisher than even the most productive groups on campus. Therefore, they usually know all glitches within the interfaces involved as well as special regulations due to contracts.
- In view of the Helmholtz Open Science Policies the institutions have to report on their Open Access rates with a 100% goal to be reached in 2025 [51, 52]. As this includes Green OA it is sensible to derive the reports from the repository.

2.3.3 Information Budget

In view of the information budget (see also section 1.4 and in more details chapter 4) the actual approach in JOIN² can be considered consistent with the core of Figure 4.1 taking section 4.2.2.1 into account. Therefore, JOIN² currently lives on the basic costs as defined in section 7.3. It does not deal with the outer shells and may never do, as the repository is focused on single publications. On the other hand the repository approach offers detailed, fine granular data for an important and most likely growing part of the overall information budget. Additionally, the mentioned central invoicing (subsection 2.3.1) allows to unearth expenditures for information that went by unseen in the past. A quick look at individual expenditures for e. g. Closed Access publishing already demolishes the myth that only Open Access requires publication charges.

2.4 Conclusion

With the ambition to actively contribute to the transformation process of scholarly publishing in accordance with FAIR[9] principles JOIN² decided to identify collective strategies to organize their publication costs management centralized in their entirety. The JOIN² partner institutions can reflect on many years of successful cooperation and will continue to work on optimizations as well as the further realization of the openCost. Although they formally share the same baseline, that means the context of their repository infrastructure, they nevertheless deal with rather different institution-specific requirements: The publication costs scenario varies depending on the institutional conditions, e. g. data acquisition, the interaction between different departments involved in cost processing, funding and funding criteria, number of personnel, and constraints on or urgency of action.

Thus, even though the JOIN² institutions must be fetched from different stations along their road to publication costs transparency (Figure 2.4), the cooperation could be seen as *proof of concept* for realizing openCost goals. Even though individual preconditions are given, the formulated problems and challenges are mostly the same. Obstacles can be overcome and replaced by standardized solutions. openCost functions as a self-contained, independent module that is integrated as a building block into the JOIN² infrastructure, and which will be continuously adapted in the future in line with the newest joint developments. Using JOIN² as an example, various advantages could be demonstrated speaking in favor for handling

[9] **F**indable, **A**ccessible, **I**nteroperable, **R**eusable

the management and monitoring via the library in the institutional repository, ranging from data acquisition to internal evaluation and data provision.

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