Open Access activities of the German National Library of Science and Technology: SCOAP3-DH and the support of German universities for arXiv

Uwe Rosemann
German National Library of Science and Technology
Abstract

The German National Library of Science and Technology (TIB) is committed to promoting Open Access. Among other activities TIB focuses on developing sustainable business models to support Open Access resources used by the scientific community in two projects: SCOAP³-DH and coordinating the support of the German universities for the Open Access platform arXiv.

Goal of the worldwide project SCOAP³ is to convert the most important journals of High Energy Physics to genuine Open Access Journals of the Golden Road. In the past, these journals were mainly financed by subscriptions. In consequence, only subscribers had access to the contents of the journals. According to the SCOAP³-model, the publication costs will be covered by contributions to the SCOAP³-Consortium of those institutions to which the publishing scientists are affiliated. The publishers will be paid for their services (e. g. Peer Review and editorial services) by the SCOAP³-Consortium. The amount to be paid will be negotiated between the publishers and the SCOAP³-Consortium in a public tender and will be raised by redirecting subscription fees.

Within the project SCOAP³-DH TIB is coordinating the participation of the German universities in the worldwide SCOAP³-Consortium.

From 1991 until 2010 the Cornell University Library operated and maintained the established Open Access platform arXiv alone. In January 2010 the Cornell University Library announced their plans to develop a long term business model to raise contributions to the costs from those institutions that benefit most from arXiv. TIB is coordinating the support of the German universities.

Keywords: Open Access, business model, financing model, arXiv, SCOAP³, SCOAP³-DH, arXiv-DH

With more than 6 million media units, 24,600 journal titles and about 12 million patents, the German National Library of Science and Technology (TIB) ranks as one of the largest specialized libraries worldwide. It is jointly financed by the federal government and the federal states (“Länder”) of Germany. TIB is a member of the Leibniz-Association, an umbrella organisation for 87 institutions conducting research or providing scientific infrastructure.

Within Germany, TIB is one of six libraries with a nationwide focus. According to national collection policies within Germany, TIB is obliged to acquire all publications (printed, electronic, published by commercial publishers or grey literature) for all areas of engineering as well as architecture, chemistry, information technology, mathematics and physics, independent of whether it was published in Germany or outside Germany (Richtlinien zur überregionalen Literaturversorgung der Sondersammelgebiete und Virtuellen Fachbibliotheken. Deutsche Forschungsgemeinschaft – DFG 2010).

Due to the close cooperation with the university library of Hannover, TIB has a local assignment as well as a national and international focus. Apart from the services provided for local users and the university campus (reading rooms, etc.) it provides access to electronic resources (e. g. national licensing program) and operates a large document delivery service...
which provides services for commercial as well as academic clients via its online portal GetInfo.

TIB is one of the libraries to negotiate licenses for the national licensing program and is involved in the Knowledge Exchange initiative for multinational licensing of DEFF in Denmark, the SURF Foundation in the Netherlands, DFG in Germany and JISC in the UK (Knowledge Exchange 2011).

The German National Library of Medicine, German National Library of Economics and TIB have formed the Leibniz Library Network for Research Information called Goportis, to bundle knowledge and initiate further development in the fields of document delivery services, licences, non-textual or multimedia materials, long-term preservation and Open Access (Goportis 2011).

TIB continuously strives to enhance its services by developing new tools for subject specific document retrieval to provide better access to text-, multimedia- and audiovisual documents and to ensure long-term storage of its holdings in projects (PROBADO, Chem.de, long-term-archiving).

Open Access for TIB

The Leibniz Association was one of the first signatories of the Berlin Declaration on Open Access to Knowledge in the Sciences and the Humanities. Thus TIB supports the implementation of the Open Access concept in accordance with the principles stated in the Berlin Declaration (2003) and the Open Access guidelines of the Leibniz Association (2007).

The Leibniz-Association is a member of the Alliance of German Science Organisations (“Allianz-Initiative der deutschen Wissenschaftsorganisationen”). In 2008 the Alliance launched the “Digital Information” priority initiative, which declared the further development of new funding and business models and the respective cooperative funding models in pilot projects (Golden Road) as well as the promotion of institutional and subject specific Open Access repositories (Green Road) to be the most important goals to be pursued till 2012 (Schwerpunktinitiative Digitale Information der Allianz der deutschen Wissenschaftsorganisationen - Arbeitsgruppe Open Access 2009).

TIB promotes Open Access in the scientific fields served by TIB – natural sciences and technology - in its own projects and in collaboration with other institutions.

Among other activities and projects in the field of Open Access, TIB concentrates on developing sustainable business models with a special focus on cost distribution among the German universities in two projects: SCOAP³-DH and arXiv-DH. This is a very specific but in view of the sustainability and long-term availability of Open Access resources, an essential contribution to Open Access for the future.

1. SCOAP³: Open Access in High Energy Physics

SCOAP³ is a worldwide international consortium to promote Open Access in High Energy Physics (HEP). It was initiated by CERN, which coordinates the project on the international level until the consortium officially comes into existence (SCOAP³-international 2011).

SCOAP³ stands for “Sponsoring Consortium for Open Access Publishing in Particle Physics”. Members of the consortium will be research funding agencies, research organisations and laboratories, university libraries and library consortia from all parts of the world.

According to the SCOAP³ Working Party (2007), about 90 % of HEP articles are published in seven core journals, which are edited by commercial publishers and financed by subscriptions. The goal of the initiative is to convert these journals to Open Access journals of the Golden Road in cooperation with the publishers so that all HEP contents are immediately published as Open Access.

Together with the Max-Planck-Society and the Helmholtz-Association, TIB coordinates the participation of the German institutions in the worldwide SCOAP³-Consortium.

Publishing in HEP
SCOAP$^3$ takes into account the special situation in the HEP publishing landscape, which is especially well prepared for this experiment (SCOAP$^3$ Working Party 2007):

About 90 % of all HEP articles are published in the following seven core journals, which are edited by commercial publishers and financed by subscriptions:

- **Physical Review D** (American Physical Society)
- **Physics Letters B** (Elsevier)
- **Nuclear Physics B** (Elsevier)
- **Journal of High Energy Physics** (Springer)
- **European Physical Journal C** (Springer)
- **Physical Review Letters** (American Physical Society) – 10 % HEP-contents
- **Nuclear Instruments and Methods in Physics Research A** (Elsevier) – 25 % HEP-contents

The scientists in HEP are a close-knit scientific community with a limited number of publications, where the group of authors and the group of readers are almost identical: All research conducted is publicly funded and the scientific results are seldom used for commercial purposes.

In HEP, the scientists themselves promoted Open Access by launching the Open Access-server arXiv, which now hosts about 90 % of all journal articles published as pre- and postprints in HEP. The green road to Open Access is therefore already established.

Even though the preprint server arXiv enables the scientists to communicate and discuss scientific results very quickly, the quality control performed by high-quality journals with a peer review-process is seen as indispensable due to the fact that scientists and the productivity of work groups are measured by the number of publications in high-quality journals.

**The concept**

The seven core journals in HEP with a high quality peer-review process will be converted to Open Access (either entirely or in part, depending on the amount of HEP-contents).

Even though the focus of the project currently lies on the seven core journals named above, other journals may become part of SCOAP$^3$, as will be explained below (SCOAP$^3$ Working Party 2007).

After the conversion, the Consortium will pay a fee to the publishers to cover the costs of their services for all published articles worldwide. The SCOAP$^3$-Consortium will be the only negotiating partner for the publishers regarding these journals.

Thereby the journal will not be financed by putting a fixed price to the finished product in the form of a subscription fee, but by quantifying and paying the costs for each step in the publication process. In this way the peer-review process as accepted quality control mechanism will be maintained and financed along with immediate publication costs by the international SCOAP$^3$-Consortium.

It is expected that this will lead to more transparency regarding the costs of the publication process and in the end to significant cost reductions. The SCOAP$^3$-model can also enable the scientific community to define the standards for scientific publishing (velocity of peer review and publishing procedure, emerging other quality factors apart from the impact factor).

The results of the SOAP-Study (“Study on Open Access Publishing”) support the concept of SCOAP$^3$: 89 % of the respondent scientists think that Open Access would be beneficial for their field (Lambert 2011). The most important reasons for not publishing in Open Access Journals are the lack of funds and the lack of high quality journals (Mele 2011).

**Financing of SCOAP$^3$ – Tendering procedure**
According to an initial cost estimate based on the article processing charges requested by commercial publishers, a yearly sum of 10 mio € worldwide will be necessary to cover all costs of the consortium, including a contribution of the industrial nations towards covering the costs of financially weaker countries. The exact conditions for a participation in the consortium, the exact amount to be paid to the publishers by the consortium and the conditions for the un-bundling of subscription packages and how to deal with long-term agreements will be negotiated in a public tendering procedure (Mele 2009):

The SCOAP³-Board (head of the consortium, composed of representatives of the most important partners of SCOAP³) will define the desired services, Open Access conditions and all aspects regarding the transition from the subscription model to an Open Access model in advance and publicly invite the publishers to make offers. All journals can answer the call for tender. The selection of the participating journals will be done by quality (one aspect will also be the impact factor) and price.

The international tendering procedure will begin as soon as enough partners have pledged the necessary funds. Whereas in Europe and the USA the funding is secured, the coordinators on the international level are currently waiting for decisions by partners in Asia, Southamerica and Russia.

The contributions of each country to the consortium will be calculated according to the quantity of publications of each nation in HEP in relation to the entire number of publications worldwide:

After the implementation of SCOAP³, subscription fees will not be owed anymore. The institutions will raise the contributions by redirecting the subscription fees to consortial fees and paid to the SCOAP³-Consortium. In case a sustainable model for the consortial partners cannot be found, a return to the subscription model must remain possible.

**SCOAP³-DH: Open Access for HEP in Germany**

The concept for the distribution of the costs on the international level leads to a total sum to be raised for all HEP-publications of German authors. The distribution of the costs on the national level must be coordinated by each country individually.
In Germany, three organisations or groups of organisations have to be considered: The Max-Planck-Society (MPG) and the Helmholtz-Association of German Research Centres (HGF) for their research institutes and about 42 German universities as individual partners. In all these organisations, research in HEP is done and articles are published. Due to the fact that there is no central organisation which could decide about the participation in SCOAP³ on behalf of these very heterogeneous institutions, all have to be involved on different levels. This quantity of potential partners leads to the necessity of giving SCOAP³ in Germany a structure adapted to the German HEP-landscape:

TIB will coordinate the participation of the German universities and other interested institutions in the SCOAP³-Consortium in the project SCOAP³-DH (SCOAP³-Deutsche Hochschulen) and will work together closely with the other two German partners, MPG and HGF. Together, these three partners represent the entire HEP publishing landscape in Germany and will be represented in the SCOAP³-Board. The structure in other countries can be very different, depending on the number of institutions actively conducting research in HEP and on the library and information structure in the specific country. Some countries have a central administration regarding scientific information services and maybe only one institute which actively conducts research in HEP.

**Business model for German universities and other institutions**

According to the initial cost calculation on the international level, 10 mio € will be necessary to cover the costs for all publications of German authors. Germany had a quota of 9.1 % of all HEP publications worldwide, the German institutions will be expected to contribute about 1 mio € to the budget of the SCOAP³-Consortium per year (including a 10 % bonus for financially weaker countries). MPG and HGF will contribute 350,000 € to cover publication costs of their scientists. The German universities and other institutions will be expected to raise the remaining 650,000 €.
TIB will develop the business model for the German universities and other institutions. The cost distribution between the German universities and other institutions on the national level must be based on different factors than the cost distribution on the international level:

Whereas to distribute the costs on the international level based on the number of publications in HEP of each participating country is reasonable, it is not possible to distribute the costs between the individual institutions based on the publication ratio of the institutions: This would lead to a huge reallocation of the costs and in the end research intensive institutions would indirectly be punished by having to pay more than they are currently paying under the subscription model.

The financing model for the distribution of the costs will therefore be based on the following key considerations:

- The institutions will become institutional members of the consortium.
- Subscription fees which are currently paid will be the upper limit of the consortial fee.
- No additional author fees will be requested.
- The distribution of the costs will not be based on publication ratio of each institution, but will take other statistic elements such as FTEs into account.
- Additional costs which arise during a transitional period will be covered by funds granted for the project SCOAP$^3$-DH by the German Research foundation (DFG) for an interim period, after which the model must finance itself.

Essential goal for the project is to develop a model for cost-distribution based on objective criteria, which can still be used in a few years and which is not only based on the amount of subscription costs which have been paid up till now.

The institutions have to coordinate how to raise their share of the costs. They have several possibilities: First of all they are asked to redirect the subscription money to the consortium, which will cover the costs. Additionally they can recur to funding programs of funding organisations: For example the DFG has set up a special funding program to endow the universities with funds to support their scientists when publishing in gold Open Access Journals listed in the Directory of Open Access Journals as layed out in the Guidelines for Open Access Publishing (Merkblatt Open Access Publizieren. Deutsche Forschungsgemeinschaft 2010).

**Costs and benefits of SCOAP$^3$-DH for universities**

An essential factor for the success of the SCOAP$^3$-model in Germany is that it does not lead to higher costs for the institutions than the current subscription model. Due to the funds provided by the DFG for the project SCOAP$^3$-DH the considerable costs for coordination and transition of the SCOAP$^3$-journals to Open Access will not have to be paid by the universities.

Apart from the obvious benefits for the institutions such as universal access and no administration of subscriptions or access, it is expected that the SCOAP$^3$-model will lead to cost reductions after an initial period. The administration for the SCOAP$^3$-Consortium for the German universities and other institutions will be integrated in other nationwide projects already implemented at TIB (national licenses), so that the already established workflows can be used also for SCOAP$^3$-DH.

**2. Support of the Open Access Repository arXiv**

The scope of the subject-specific preprint Server arXiv is to provide the scientists with a communication platform for the immediate worldwide exchange and discussion of the newest scientific results. Due to the fact that the publication process in a high-quality peer-review journal takes about six months (Moed 2007), the platform has become an indispensable instrument in the scientific communication process (Klanner 2010). ArXiv was set up by Alan Ginsparg at the Los Alamos National Laboratory in 1991 and when its founder transferred to Cornell University in 2001 the platform was also transferred to Cornell University Library (Cornell). Since then it has been supported and continuously improved exclusively by Cornell (arXiv Business Model Whitepaper. Cornell University Library 2010): The budget envelope for
arXiv in 2011 is projected to be at about 504,000 USD (arXiv 2011 Budget (projected). Cornell University Library 2010).

In January 2010 Cornell announced its plans to implement a cooperative financing model for arXiv by 2012/2013 (Press Release. Cornell University Library 2010). Until the implementation of the new model, Cornell tries to raise additional funds from the heaviest users of arXiv on a voluntary basis.

Relevance of arXiv

Some figures demonstrate the relevance of arXiv as an information resource for the scientific community: arXiv currently contains altogether about 650,000 documents. Whereas it originally only covered HEP content, it has continuously grown and now covers the following scientific fields (Cornell University Library 2011):

<table>
<thead>
<tr>
<th>Subject</th>
<th>Start</th>
<th>Proportion of overall contents of arXiv in [%]</th>
<th>'10 submission rates in [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Energy Physics (hep)</td>
<td>1991</td>
<td>22.3</td>
<td>12.6</td>
</tr>
<tr>
<td>Condensed Matter (cond-mat)</td>
<td>1992</td>
<td>18.2</td>
<td>15.9</td>
</tr>
<tr>
<td>Astrophysics (astro-ph)</td>
<td>1992</td>
<td>18.0</td>
<td>16.6</td>
</tr>
<tr>
<td>Mathematics and Mathematical Physics (math+math-ph)</td>
<td>1997</td>
<td>17.6</td>
<td>25.0</td>
</tr>
<tr>
<td>Quantum Physics (quant-ph)</td>
<td>1994</td>
<td>5.1</td>
<td>4.8</td>
</tr>
<tr>
<td>Physics (other)</td>
<td>1991</td>
<td>5.0</td>
<td>7.0</td>
</tr>
<tr>
<td>General relativity and Quantum Cosmology (gr-qc)</td>
<td>1992</td>
<td>3.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Nuclear Physics (nucl)</td>
<td>1992</td>
<td>3.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Informatics (cs) – CoRR</td>
<td>1998</td>
<td>3.7</td>
<td>9.3</td>
</tr>
<tr>
<td>Nonlinear Sciences (nlin)</td>
<td>2000</td>
<td>1.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Quantitative Biology (q-bio)</td>
<td>2003</td>
<td>0.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Statistics (stat)</td>
<td>2007</td>
<td>0.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Quantitative Finance (q-fin)</td>
<td>2008</td>
<td>0.2</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Approximately 30 million documents are downloaded by scientists worldwide per year.

Whereas in other scientific fields covered by arXiv the quota of articles published on arXiv as well as in high-quality peer-reviewed journals has not been analysed reliably, for some journals in HEP it reaches almost 100 % (SCOAP³ Working Party 2007).

Activities of Cornell

Since Cornell announced its plan to establish a cooperative financing model, several steps have been taken:
First of all, a Sustainability Advisory Group was formed. Its role is to advise Cornell regarding different possible financial and technical models, to accompany the introduction and move to a different financing model and to advise on a future organisational model. Members of the group are representatives of those institutions of other countries which belong to the heaviest users of arXiv, based on the number of documents downloaded by scientists of each institution. The goal is to find a business-model which enables Cornell to raise the necessary funds to maintain arXiv as a reliable and innovative resource for the scientific community and adapt it to future needs. The decision which model will be implemented will be taken by Cornell alone.
The models considered by Cornell are based on suggestions made in the ITHAKA report on “Sustainability and Revenue Models for Online Academic Ressources – an Ithaka Report” (ITHAKA 2008).

Since the authors and users are not supposed to pay for the services directly in terms of author or download fees, the model will be based on an institutional membership. The contributions will be asked from those institutions, whose scientists most benefit from arXiv. At this stage, it has not been decided yet whether the contributions will be based on the number of downloads or the number of submissions of affiliated scientists. If a consortium joins, a consortial discount will be made (arXiv Business Model Whitepaper. Cornell University Library 2010).

As additional financial sources corporate sponsorships (e.g. naming of a sponsor on web-pages), advertising (search or banner advertisements, classified ads), the setting up of an endowment or additional income due to value-added services will be considered. arXiv may also be a potential beneficiary of SCOAP³ regarding HEP and particle physics contents when the SCOAP³-Consortium is formed.

Advised by the Sustainability Advisory Group, Cornell evaluates the different models and possible combinations of models.

**Support for arXiv in Germany**

ArXiv is firmly established in the scientific communication process of the covered scientific fields and is heavily used by the German scientific community: In 2009, German universities generated 9.2 %, research institutes of the MPG 3.1 % and of HGF 1.86 % of all downloads. The overall submission rate from German authors from the domain .de in 2009 was 8.2 % according to data specifically analysed for TIB by Cornell in 2010. This compels TIB and the other German partners to support arXiv.

In Germany, the situation for arXiv is as complex as for SCOAP³ regarding the number of institutions which belong to the heaviest user groups of arXiv and should therefore contribute to the costs: Research centres of MPG and HGF and about 75 German universities are users of arXiv. Therefore, just as for SCOAP³, three organisations or groups of organisations have to be involved to organise the support for arXiv: MPG and HGF for their research centres and the group of German universities.

In the beginning of 2010 TIB was approached by the German Physical Society (DPG) with the aim to let TIB act as intermediary for Cornell to coordinate the involvement of the German universities in the support for arXiv.

With the support of the respective scholarly societies (DPG, German Mathematical Society - DMV, Society for Informatics - GI, Astronomical Society - Astr. Ges. and the University of Augsburg which provides the German mirror site of arXiv) and in accordance with the other German partners MPG and HGF, a funding request was prepared by TIB and granted by DFG.

A Memorandum of Understanding between Cornell and TIB provides the basis for the future cooperation between TIB and Cornell and the representation of the German universities and other institutions by TIB until a long-term business model has been found for arXiv.

The German partners (MPG, HGF and TIB for the German universities and other institutions) will be represented in the Sustainability Advisory Group. The task of the German representative is to support Cornell by providing inside knowledge and raising the awareness for special issues in Germany which have to be kept in mind when drafting a long-term business model on an international level (e. g. regarding funding policies).

**Project arXiv-DH at TIB**

The official start of the project at TIB is April 2011. Central project activities are the collaboration with other representatives of institutions from all over the world on the arXiv Sustainability Advisory Group, to develop a financing and organisational model and solicit a funding body for the share of costs of the German universities.
The conditions of the model found by Cornell will lead to a fixed sum to be raised by all German partners together. The sum has to be split up among the German partners and an appropriate model for the distribution of the costs among the German universities and other institutions will have to be developed. An important criterion is the cost efficiency of the model: The costs for sustaining arXiv are relatively small compared to the sums which have to be raised to finance the SCOAP³-Consortium. It is therefore not feasible to approach the individual institutions regarding the costs for the usage of their scientists, because the costs for the administrative effort would be higher than the amount which has to be raised. Thus a funding body of very few institutions or organisations willing to cover the costs in the long run will have to be found. So far there is no central institution to provide funding for Open Access resources as long-term infrastructure investments in Germany. It is also a political question if and how public access to publicly financed scientific results (not only by the scientific institutions, but by the public in general) can be financed and whether this has to be financed by the universities or by funding bodies such as DFG or the federal government. So far, the funding policies often exclude the possibility of providing long-term funding outside of short-term projects. These discussions will have to be lead.

In the end, a funding body has to be found to sustain the necessary costs and the model implemented. After the introduction of the cooperative funding model, TIB will continue to administer the consortium on behalf of the German universities.

**Costs and benefits of arXiv-DH for institutions**

Just as for SCOAP³-DH, the administrative costs for the transition to a new financing model for arXiv and the contributions for the transitional period are funded by DFG. Considering that the nationwide contributions to be raised for arXiv are not very high compared to the amount to be raised for SCOAP³, it is better to develop a financing model which does not involve all German universities, but to find a small number of central funders for the platform: The costs for developing the business model and administering the contributions after a cooperative financing model has been found should not be higher than the amount which has to be contributed.

In case the universities have to contribute their share of the costs, these costs would be additional costs for institutions so far not projected in the institutional budgets. The costs for the administration of the support for arXiv after the implementation of the cooperative financing model will be covered by TIB, not the institutions.

**Conclusions**

The financing of Open access resources on a national level and also across international borders leads to new business models, new cost factors which have to be covered by the institutional budgets and different accounting routines which have to be implemented into the workflows. A transition to Open Access publishing models can only be successful if the costs for the institutions do not rise or are covered through other sources. Otherwise the institutions have no incentives to carry out the work necessarily connected with the transition. In consequence, additional funding by a funding body is necessary to cover the costs of transition. Both projects regard physics or related fields. Even though according to the results of the SOAP-Study all scientific fields would benefit from Open Access, it remains to be seen for which other resources and other scientific fields the specific models presented here are of interest and could be implemented. Both projects show that international collaboration is essential to achieve a successful transition to Open Access.

**REFERENCE LIST**


