

## REPORT ON THE EUDML EXTERNAL COOPERATION MODEL

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ABSTRACT. One of the main tasks of the European Digital Mathematics Library project was to define a cooperation model with a variety of stakeholders that would allow building a reliable and durable global reference library, aiming to be eventually exhaustive. In this paper we present the EuDML external cooperation model and the business plan as the basis for its sustainability and further development.

### 1. INTRODUCTION

The European Digital Library (EuDML) [1, 2, 3, 4] was a project partly funded by the European Commission in the Competitiveness and Innovation Framework Programme, Information and Communication Technology Policy Support Programme, in the period from 1 February 2010 to 31 January 2013. The EuDML project was explicitly envisioned as a pilot project addressing two challenges that prevented previous attempts towards a global digital mathematics library based on a top-down approach to succeed:

- (1) Setting up the technical infrastructure to create a unified access point for the digital mathematical content hosted by a number of different organizations across various countries;
- (2) Defining a cooperation model with a variety of stakeholders that would allow building a reliable global reference library meant to run over the long term, and to be eventually exhaustive.

During the three years of the project, these two goals have been pursued in parallel with stubbornness. On both sides the project reached clear successes and modified the state-of-the-art. The basic infrastructure is up and running, with a critical mass in content. A number of possible partners have declared interest in the

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K. Kaiser, S. Krantz, B. Wegner (Eds.): Topics and Issues in Electronic Publishing, JMM, Special Session, San Diego, January 2013.

initiative. However a lot remains to be done in order to secure these results and set the basis of a strong and inclusive infrastructure.

A general overview of the project and its outcome is described in [5]. There is some slight overlap between both papers, in order to keep each of them self-contained. In this paper we report on the second goal mentioned above. In the first section we describe the situation that evolved from the project. The second section is devoted to the EuDML sustainability plan.

**Acknowledgement.** The work reported here has been partly funded by the European Union through its Competitiveness and Innovation Programme (ICT PSP, Grant Agreement no. 250503).

## 2. EU DML AT THE END OF PROJECT

The EuDML has been built by the motley consortium of 16 partners from 8 European countries, which comprised a variety of stakeholders and expertise: universities (Instituto Superior Técnico Lisbon, Université Joseph-Fourier Grenoble, University of Birmingham, Uniwersytet Warszawski, Universidade de Santiago de Compostela, Ionian University Corfu, Masaryk University Brno), research institutes (Institute of Mathematics and Informatics BAS Sofia, Institute of Mathematics AS CR Praha, CNRS Grenoble), an international scientific service institution (FIZ Karlsruhe), a national research council (Consejo superior de investigaciones científicas Madrid), a commercial publisher (Édition Diffusion Presse Sciences Paris) and a private digital media agency (Made Media Ltd Birmingham), a large library (Niedersächsische Staats- und Universitätsbibliothek Göttingen) and, last but not least an international learned society (European Mathematical Society). The latter two had the status of associated partners to which another one came in the early stage of the project: Biblioteca Digitale Italiana di Matematica (bdim). They included digital content providers, technical developers, library, a scientific database and representatives of research communities.

EuDML as the outcome of the project aims to be a long-standing, reliable and open source of trusted mathematical knowledge. This implies EuDML policies, that mostly boil down to the following:

- (1) *The texts in EuDML must have been scientifically validated and formally published.*
- (2) *EuDML items must be open access after a finite embargo period. Once documents contributed to the library are made open access due to this policy, they cannot revert to close access later on.*

- (3) *The digital full text of each item contributed to EuDDL must be archived physically at one of the EuDDL member institutions.*

These rules ensure that the EuDDL as reference library system is on a sound base, with ingested content available for perpetuity and openly accessible eventually. For this purpose the project set up a complex of frameworks, technology, workflows, validation procedures, schemas etc. The EuDDL was built as a distributed system with tasks distributed among partners each of whom assumes full responsibility for the corresponding segment.

This worked well during the project when the partners formed a formal consortium tied together by a formal contract setting responsibilities with respect to the European Commission. The contract finished together with the project and will be replaced with a suitable arrangement which we describe in Section 3.

The EuDDL is not limited to the current digital content and the technology built above it. There is also important potential of further cooperation and extendibility.

On the technical front, the EuDDL got expression of interest, but rather in the form of attracting new partners in some follow-up to the current project. On the political front, the EuDDL got quite some awareness and support from mathematical societies on various occasions (The International Mathematical Union at the WDDL symposium in Washington D.C., June 2012 [6], the European Mathematical Society and some national mathematical societies at the EuDDL workshop in Prague, 2010). On the content front, there has been a large number of discussions with potential further partners (eLibrary of the Mathematical Institute of the Serbian Academy of Sciences and Arts in Belgrade, digitized proceedings of the International Congress of Mathematics and European Congress of Mathematics, project Euclid at the Cornell University and Steklov Mathematical Institute/Russian Academy of Sciences' project Math-Net.Ru).

An important decision that has been taken after the 6ECM round table [7] is that the EMS Publishing House will contribute the *Journal of the EMS* after a 5 years moving wall. Work to achieve this has started, partly handled by our partner Institute of Mathematics AS CR in Prague acting here as a sponsor for EMS-ph. A contact has been also attempted with JSTOR (resp. Elsevier) in the hope to acquire their public domain (resp. Open access archival) content and make it visible in EuDDL.

The effort of the EuDDL consortium does not end with creating a functional prototype of the Digital Mathematics Library and providing its content and services

to the public. The true success of the project depends very much on sustainability and further development of the EuDML. The principal aims of sustainable EuDML services comprise

- working toward comprehensiveness, service integration, and cost efficiency of the EuDML services,
- assisting in exploiting the benefits of networking for integration of digital library services such as sharing and enhancing data,
- advancing cooperation between information and service providers,
- creating and maintaining a non-profit service in the interests of the mathematics user community.

In order to create such sustainable service from the EuDML project, important issues have been assessed, namely

- an organizational and legal framework, which will take its roots in the EuDML consortium and further partners associated during its lifetime,
- balancing costs and potential sources of revenue of running the EuDML services,
- a common framework for dealing with intellectual properties rights and copyright issues.

### 3. PRINCIPLES OF THE EUDML INITIATIVE

**3.1. Organizational and legal framework.** Twelve partners of the consortium declared their will to continue in efforts to maintain and develop the EuDML after project's end, representing the general mathematical community and the core content and technology providers:

- (1) The European Mathematical Society
- (2) FIZ Karlsruhe Berlin
- (3) Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw
- (4) Cellule Mathdoc, Centre national de la recherche scientifique & Université Joseph-Fourier, Grenoble
- (5) University of Birmingham
- (6) Institute of Mathematics and Informatics BAS, Sofia
- (7) Institute of Mathematics AS CR, Praha
- (8) Masaryk University, Brno
- (9) Ionian University, Corfu
- (10) Società Italiana per la Matematica Applicata e Industriale
- (11) Unione Matematica Italiana
- (12) Niedersächsische Staats- und Universitätsbibliothek Göttingen

They will form an association named EuDML Initiative where the first three of them will assume particular rôles. The European Mathematical Society will provide an umbrella using its institutional authority to secure the association's internal functioning and its external representation with respect to partners, other institutions and the general public. It is also expected, in particular, to ensure that the EuDML services shall remain under control of organizations representing the public interest. For the first period of at least three years, partners no. 2 and 3 will provide human resources and machine capacities for hosting, system and service maintenance, and basic technical operations. Partner no. 4 will contribute manpower to continue enhancing the metadata quality, ingestion procedure, and will help new content providers to contribute their collections. Partner no. 7 will take care for annotations moderation and dissemination activities.

The EuDML Initiative will be established as an association without legal personality. The status of an association without legal personality and financial budget will be perfectly functional at least for the first period, during which the possibility/necessity of transforming the EuDML Initiative to another model involving legal personality and financial issues will be investigated.

The purpose of the EuDML Initiative is to provide a Digital Mathematics Library (DML) for the worldwide scientific community as a public service which will help users locate the information that is distributed in various digital repositories and discover information related to their work in an efficient way, and encourage the public in using it as a public resource of knowledge which will become exhaustive and comprehensive in the field of mathematics.

The basis for such DML is provided by the EuDML. The EuDML Initiative will

- encourage content providers to join and integrate their content to the EuDML,
- adapt to using new information technologies and invite subjects interested in contributing to research and development for the continuous evolution of EuDML to join,
- search for projects of research and development aiming at improving its services to the user community and will encourage its members to get involved in such projects.

Membership in the EuDML Initiative will be open to any legally and contractually competent natural or legal person willing to support the objectives of the EuDML Initiative by providing

- digital content, i.e. integrating (at least partially) their digital collections of high-quality mathematical publications in the EuDML according to the EuDML guidelines and standards, which are based on internationally

- accepted standards and trends, adapted to the special needs of mathematical publications, and maintaining and expanding access to these publications through the EuDML service,
- technological equipment and services for maintaining the EuDML central services and/or developing other technical services and tools to be used in the EuDML,
  - scientific, financial, strategic or political support to the EuDML Initiative and its activities.

Members will have the duty to take part in the activities necessary for the satisfaction of the objectives of the EuDML Initiative and to comply with the decisions of the bodies of the EuDML Initiative, with the statute and the applicable legislation. Members of the EuDML Initiative are not obliged to make any financial contributions. Each member cares for his own costs.

The governance and operation of the association will be organized in the following bodies: the General Assembly, the Chair of the EuDML Initiative, the Executive Board, the Scientific Advisory Board and the Technical Committee; in conducting legal or other affairs the Initiative shall be represented by the Chair of the Initiative.

The General Assembly as the supreme decision-making body will be formed by one representative of each member. The tasks assigned to the General Assembly include decision on applications for membership, decision on expulsion of a member, election and dismissal of the Chair of the EuDML Initiative, the members of the Executive Board and of the Technical Committee from persons suggested by members of the EuDML Initiative, issuing instructions to the Executive Board, decision on modification of the statutes and the dissolution of the EuDML Initiative.

The Executive Board will be composed of the Chair of the EuDML Initiative, the Chair of the Technical Committee and three other persons representing members of the EuDML Initiative. The European Mathematical Society's eminent rôle and responsibility in the EuDML Initiative will be accomplished by the fact that one member of the Executive Board will be directly nominated by the EMS Executive Committee. The Executive Board shall have general charge of all matters concerning the EuDML Initiative except for those assigned to the General Assembly, in particular, management of the current affairs including copyright and ownership management, execution of the decisions of the General Assembly, appointment of the subordinate committees entrusted with the special tasks within general framework of the association. The Executive Board will be advised by the Scientific Advisory Board and supported by the Technical Committee.

The Scientific Advisory Board will be appointed by the European Mathematical Society of their representatives and other suitably qualified and recognized persons. It's responsibility will be ensuring the scientific quality of the DML service, and advising the Executive Board on scientific matters, strategic orientations and priorities for development of the service, taking part in the evaluation, and bringing in the feedback of the mathematical community. The Scientific Advisory Board works out recommendations for the development of EuDML with regard to the content and the organization of the EuDML Initiative.

The Technical Committee will ensure the continuous technical operations of EuDML services being responsible for the technical development, technical standards and workflows, and the technical operations of the system. The Chair of the Technical Committee will be automatically member of the Executive Board, assuring cooperation of both bodies.

**3.2. Costs and sources of revenue.** It is estimated that basic operation and maintenance of the EuDML system will require approximately 1.5 FTE and k€100 yearly. This will be covered by in kind payments of the five partners indicated in Subsection 3.1. Each EuDML Initiative member will cover his local expenses which concerns, in particular, the content providers responsible for keeping and developing their repositories. It is assumed that all bodies of the association will meet via telecommunication if appropriate. Videoconferencing has proved a very efficient management tool during the EuDML project and will reduce the running costs.

The minimal level of resources corresponding to the costs indicated above will be sufficient for the maintenance and slow development of the EuDML. However, higher revenues are desirable for a more dynamic advancement. Possible resources to cover these costs may include income from R&D grant funding generated by the association or by its individual partners, special fees collected from the EMS member organizations, donations, financial contributions from content providers and partners of the EuDML Initiative and in kind contributions by partners.

Despite its universal usage in science, technology, education, social matters etc. mathematics has rare possibilities to generate incomes directly. All the more the EuDML as a not-for-profit establishment providing public service will have to struggle for regular resources using the potential of all partners involved and of the scientific community represented particularly by the European Mathematical Society and other mathematical societies and organizations.

**3.3. Common principles for handling data and tools.** It is very important that the potential external partners understand who the EuDML Initiative is and

what is to be expected of a possible cooperation. Hence, the following principles should be adopted and published.

The content providers retain all rights pertaining to their collections. They grant to the EuDML Initiative the right to keep and use copies of their provided data for the purposes of search and retrieval display in EuDML public services.

Each content provider may decide, whether full text will be provided to the EuDML Initiative and to which extent the full text might be used or distributed. Agreements between the EuDML Initiative and the content providers specify these and further usage and exploitation rights for each collection contributed to the EuDML.

The indexing and other metadata information generated by the central services of EuDML (“EuDML-enhanced metadata”) is owned by the EuDML Initiative. Content providers are entitled to use and exploit copies of EuDML-enhanced metadata of those items for which they have provided metadata.

Copies of metadata provided by content providers and the EuDML-enhanced metadata shall be kept at the sites maintained by service providers. If a service provider withdraws from this rôle, the data and respective rights and obligations stay with the remaining service providers. Members of the EuDML Initiative active in the research domain of Digital (Mathematics) Libraries are entitled to use (copies of) the EuDML-enhanced metadata for their research purposes. However, usage of a particular subset of the metadata for this purpose may be restricted by the respective information provider. Results of such research activities will be made available to the EuDML Initiative and its members.

Exploitation rights for software and tools developed by the EuDML Initiative stay with the originator. However, the EuDML Initiative advocates an open-source policy for software, and encourages developers to put their developments for DML in the public domain. In case of dissolution of the EuDML Initiative, all (meta)data and related rights are to be transferred to the European Mathematical Society.

#### 4. CONCLUSIONS

A cooperation model with a variety of stakeholders has been successfully developed by the EuDML project for building a reliable and durable global reference library, and a number of possible partners have declared interest in the EuDML Initiative.

The EuDML policy was developed stating three main principles: (i) the digital content must be scientifically validated, (ii) eventual open access, (iii) physical archiving of the content at one of the EuDML member institutions.

Contacts were made with several possible external partners to ingest their digital content in EuDML. In some of these cases, the technical work has already started. Based on the above policies, a model of sustainable EuDML operation has been drawn on the basis of an association without legal personality formed by EuDML core members being scientifically and organizationally strong not-for-profit institutions that take care of the system's activity, maintenance, and of the collections both in terms of preservation and eventual open access provision. Three partners, EMS, FIZ/zbMATH and ICM will assume particular rôles providing an umbrella securing association's internal functioning and its external representation, ensuring that the DML services shall remain under control of organizations representing the public interest, and providing human resources and machine capacities for hosting, system and service maintenance, and basic technical operations during the first mid-term period after the project end. The possibility/necessity of transforming the EuDML Initiative to another model involving legal personality and financial issues will be investigated during this period.

The EuDML Initiative will be an open, democratic association with well defined structure, distributed rôles and responsibilities which will allow the long-term sustainability, form the solid basis for partnership with external entities and provide condition for further development.

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Received February 7, 2013

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