

# CREATION OF AN INTERNATIONAL DIGITAL LIBRARY OF MANUSCRIPTS: SEAMLESS ACCESS TO DATA FROM HETEROGENEOUS RESOURCES (ENRICH PROJECT)

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## **Abstract**

The Czech Manuscriptorium Digital Library has been in operation since the year 2002. It aggregates data from various cultural institutions in the Czech Republic and also from abroad. The EU eContentPlus ENRICH project (Dec. 2007 - Nov. 2009) provides the opportunity to enhance the integration of data from a number of European institutions. Manuscriptorium offers seamless access to them indifferently of the geographical location of their physical storage under its uniform interface (<http://www.manuscriptorium.eu>). It supports both harvesting via OAI as well as production of Manuscriptorium compliant data from the beginning for those who wish to create their digital library as a Manuscriptorium component part without building it completely on their site. The Manuscriptorium team has accumulated a lot of experience in work with partners and users; therefore, its current and future development is trying to respond to their requirements through actions defined as personalization both for users/researchers and contributors.

**Keywords:** digital access; distributed digital library; TEI; seamless access.

## **1. Introduction**

In cooperation with the National Library of the Czech Republic and the Czech AiP Beroun Ltd. the digitization of historical library materials started relatively early in

Prague in 1992. The two partners supported UNESCO with several pilot projects in the 1990s to promote the Memory of the World programme in the segment of digitization and digital access to documentary heritage. In 1999, UNESCO even confirmed that the Czech approach is a model for other similar activities worldwide. The strength of this approach consisted in high-quality imaging solutions in the data capture procedures, care of calibration of devices and storage of colour preservation information in several forms in parallel, while on the other hand from the beginning, the access to produced data was laid on the compound document concept, i.e. on structured combination of image data with the descriptive meta-data.

It was rather natural that this philosophy led to the application of the SGML platform in 1995/1996, but with difficulties because we had to create our own approach that we called DOBM; it was in fact, an enlargement of HTML with possibilities to describe the contents. This solution has been replaced twice already. However, much more important was the fact that the project of the National of the Czech Republic and AiP Beroun Ltd. started to also attract other cultural/memory institutions in the Czech Republic.

This was possible thanks to the emerging opportunities for libraries in taking part in national research and technology development programmes in 1996/1997, as well as later from the support of the Ministry of Culture of the Czech Republic that launched a grant programme to finance the operation of new communication technologies and the production of data for library information systems (retrospective conversion of catalogues and the national bibliography) and for the future digital libraries where two sub-programmes were created: Memoria for the digitization of manuscripts and rare old printed books and Kramerius for the digitization of modern materials published after 1800.

In this way we created a series of national digitization programmes that were based on the standards developed in or recommended by the National Library. The digital library of manuscripts combined with their catalogue (incl. some proportion of old printed books) was launched in autumn 2002 as Manuscriptorium. As such, it provided access to the data produced from the originals of several Czech libraries, and even archives, museums, and castle or monastery libraries. The nice unexpected surprise was a much bigger interest of users than before the launch, while about half of the requests were coming from abroad. Rather naturally some institutions in the vicinity of the Czech Republic started to manifest their interest in Manuscriptorium so that we started to upload their records and even to provide access to their image data. The first foreign libraries to cooperate with us were the University Library of Bratislava, Slovakia, and the Wrocław University Library, Poland.

The Manuscriptorium Digital Library had been accumulating the content from

more and more Czech institutions, while the interest from foreign countries grew. However, we lacked an important stimulus to transform this interest into real data sharing and cooperation; therefore, we tried to apply to the eContentPlus programme with a project. In 2007 we were able to begin with the ENRICH project that provided us with the opportunity to optimize Manuscriptorium and involve more foreign institutions with digitized manuscripts.

## 2. Methodology

The principles of cooperation with Manuscriptorium have developed over time, and they rely on technical agreements as well as on legal ones. The technical agreements are based on the capacity of concrete partners to work with us on the development of their own digitization projects and digital library services. Basically, there are partners with digital libraries who can communicate via the OAI protocol, and partners who have produced digital content but are unable to have their own presentation tools or these tools are not able to communicate via OAI. Of course, there are also many different types and situations in these two groups of partners. The basics for Manuscriptorium cooperation are explained below.

**The Manuscriptorium format:** the development of Manuscriptorium document formats is rather rich. It started with our own SGML application that allowed content descriptive elements together with HTML formatting elements in one file. It was an early solution that was based on our conviction that the main presentation user tool would be an Internet browser. We wanted our documents to be seen without any additional transformations – styles were about to be introduced and expanded only at that time – just on the basis of built-in treatment of HTML elements in the known browsers, the most used one being Netscape Navigator. This browser also offered the plug-in technology for easy handling of images – and we developed our own Netscape plug-in that transformed the browser into a rather good image viewer and even a partial image editor.

The general DOBM language was able to absorb most descriptive standards or good practices, and it also provided space for structural mapping of digitized documents with references to image representations. It required the so-called concrete specification for the given type of document. This specification was made by a special SGML (\*.sgm) definition file that played the role of a DTD on a lower level of specification. We had two specifications: for manuscripts and old printed books, and for digitized periodicals. The specification for manuscripts had two versions, and we worked with this approach from 1996 until 2002.

In the meantime, the XML language appeared and in particular, the MASTER

DTD whose role was the electronic description of manuscripts, issued as a deliverable from the EU MASTER project in 2001 in which the National Library of the Czech Republic was also one of the main direct partners.

The MASTER specification of the detailed description of manuscripts was above all the main reason why the production format was changed and all the documents that had been already digitized migrated. In addition to the MASTER specification, we also needed a rather detailed technical description of the produced images and a framework for mapping the document structure with references to images.

On the basis of such requirements, a `msnkaip.dtd/xsd` [1] (often called `masterx.dtd`) was defined in which the bibliographic description was a full `master.dtd` (later with added elements for printed documents) combined with the page description as needed for our programme and the technical description issued from the application of the elements from the Data Dictionary for Still Digital Images and DIG.35 definition.

Only with the apparition of the ENRICH project and on the basis of analyses of metadata from various systems in Europe, the format development moved on. The initial pre-ENRICH idea was to bridge the MASTER TEI P.4 description with the emerging TEI P.5 platform to enable the bridging of the two TEI approaches for easier data sharing in Manuscriptorium. However, the TEI P.5 application developed into `enrich.dtd`, which was able to comply with all the necessary requirements for metadata in Manuscriptorium.

In fact, two basic approaches coming from user communities in the area of manuscript description had to be taken into consideration: the pragmatic library description done in MARC format and the research community description (and often also transcription) done in TEI. In the so-called catalogue or bibliographic segment, there are certain description granularity problems when converting metadata from MASTER (TEI P.4) to MARC, while vice versa is not problematic. On the other hand, TEI offers much more flexibility and analytical depth even in the description segment and, furthermore, being a part of a complex document format, it also provides space for structural mapping.

To understand the problem properly, we have to say that there are two goals with which the document format must comply: 1. data interchange and sharing from various non-homogeneous resources, 2. data storage especially in cases where we are responsible for long-term preservation.

The initial foreseen solution was to bridge the two TEI (P.4 and P.5) approaches and prepare necessary transformations, while for the internal Manuscriptorium format to use the METS container in which various descriptive formats could co-exist in parallel. The container would also allow storage of technical and other necessary administrative metadata, as well as structural mapping. The storage in

such a container would require transformation of original formats for indexing and display; thus, the digital library database should work with all these transformations. In fact, at the description level this would not give any advantage to the possible conversion of all incoming descriptive records into a common format that would serve both for indexation and display. The role of METS would then be substantially decreased and limited only for preservation management of our own data, provided the necessary preservation and administrative information would not be stored in the main metadata file as it is today without METS. The structural mapping is enabled without problems in *masterx.dtd* and can be enabled in a TEI P.5 solution in the appropriate DTD as well [2].

There were many discussions about which way to go. Under the leadership of the Oxford University Computer Services, the TEI P.5 *enrich.dtd* [3] was created, and the project consortium decided that it suited all the requirements for the manuscript description and structural mapping as a common format able to absorb all the incoming metadata without negatively affecting their granularity. Here also, the thorough analysis of MASTER-MARC compatibility, made by AiP Beroun Ltd., helped enormously to understand the problem. Knowing this, the *enrich.dtd* has been chosen as the internal Manuscriptorium document format from which the indexation and transformations for display will be directly made.

This decision affects all the Manuscriptorium functionality substantially. It requires the reprogramming and of course, migration of all the existing documents in the digital library from *masterx.dtd* into *enrich.dtd*. It is even more difficult because there are also some Manuscriptorium-related tools that are based on the implemented document format; therefore, the complete implementation of *enrich.dtd* requires a great deal of effort. A possible METS application therefore remains a problem of local data producers in case they decide to go in this direction.

**The Manuscriptorium data representation:** in this area development was rather slow, even if at the beginning of digitization it was supposed that the evolution particularly in imaging would be rather fast and even hectic. However, the digital image area, in spite of so many formats and developments, such as wavelet technology, JBIG-based compression of black-and-white images, or Mixed Raster Content approach, has remained rather stable thanks to great penetration of a few image formats recommended for the web environment. This has enormously supported the stability of the traditional JPEG format (with DCT compression algorithm) followed by its unanimously accepted usage in digital cameras. Although TIFF (mostly for storage) and DjVu, PDF or JPEG2000 have had some contribution in the domain of presentation formats for digitized documents, especially for manuscripts; JPEG is almost the unique format for user access, while application of DjVu, PDF or even JPEG2000 are more represented in the case of printed heritage, but anyway far beyond JPEG.

The Manuscriptorium accepted formats are those recommended by the web consortium, namely JPEG, GIF, and PNG. These formats are also naturally viewable by native browser built-in display tools, while the manipulation with images requires development and application of a viewer based on generally accepted scripting technology. Manuscriptorium has its own viewer that does not need any previous installation; it provides basic zooming and some simple additional user tools.

When analyzing the application of image formats in partner digital libraries or repositories, in only a very few cases were the solutions other than JPEG. The most problematic were, however, those solutions which replaced the XML-based structural mapping of the document by multipage image files such as PDF or DjVu. This kind of solution freezes the analytical handling with individual pages and does not allow certain advanced manipulations with digital objects foreseen for some ENRICH deliverables whose role was to enhance the comfort of users. As a result, such formats have not been accepted for representation in Manuscriptorium, and in all the cases the requirements addressed to partners to convert PDF or DjVu files into individual JPEG (or possibly PNG or GIF files when only black-and-white) were met with understanding. Furthermore, in one case they led to the enrichment of local digital libraries.

Another problem is being reported currently from the ExLibris DigiTool application where only relative paths for images are made available. This situation will require further clarification.

### **3. Basic principles for contributing**

The goal of Manuscriptorium is to use its own interface for representation of any document from any partner digital library or repository. Thus, the central database must contain not only descriptions of such documents – manuscripts or rare old prints – but also their structural maps with references (individual URLs) to concrete image files. As the user wishes to consult the concrete files, they are called into the uniform Manuscriptorium viewer from anywhere they are so that the user enjoys seamless access without navigating to remote digital libraries or presentations.

In some cases, the data repository (image bank) of the remote digital library is used in parallel also by Manuscriptorium, which also provides references to the original representation in the partner digital library, provided the information about it was contained in the harvested metadata record.

In order to be able to smoothly feed the Manuscriptorium interface with the

data, we need to be sure that the location of referenced data files in the partner repository is stable. Furthermore, we need additional information to be able to define how to cooperate with the institution because the digitized data are presented in various manners, and sometimes they are not even presented at all, but exist as products of digitization.

To facilitate the work with the partner, it is recommended that he fills in the so-called Access Questionnaire that is freely downloadable from the project website. To express the partner's willingness to cooperate and share their data, the partner can also write and send a Letter of Intent (its draft text is also freely downloadable), but this is not necessary. In practice, we have good partners without any letter of intent; while on the other hand, we have had several letters of intent or support that have never been transformed into concrete cooperation because of the lack of partner's input.

If we try to classify the partners, the first division is between those who present the digitized manuscripts in a digital library or a similar application, and those who have not achieved this, in spite of the fact that they sometimes have hundreds of thousands of digitized pages stored on optical discs or computers without making them available. Sometimes, they also have CDs with digitized manuscripts, as this was the presentation practice mostly in the 1990s. We support the cooperation with both groups.

The ideal partner is one whose digital library can be harvested via OAI, while the profile contains a descriptive record with a structural map and links to images. In this case, the Manuscriptorium harvester does its job and the records are passed through the necessary transformation to produce the Manuscriptorium internal document format. Each transformation is tested with the partner, and the data is exposed in the so-called Manuscriptorium Clone, where the partner can see the results of harvesting and transformation. Sometimes this is not very easy, and individual work must be done incl. batch conversion of delivered records.

The practice shows that the harvesting and transformation of the descriptive part of the document format is not very difficult; in fact, there are no quality requirements as to length or details of the descriptive record; therefore, users can find very detailed records with analytical descriptions of the contents, together with very short records. Manuscriptorium is not responsible for this, even if in some cases we heard comments asking why such and such records are of a certain quality. On the other hand, the problem can be the structural mapping of the document, mostly from the reasons mentioned above, when the structure is expressed by a multipage file; however, the cause may also be adaptation of the digitized document to the properties of a concrete library information system when the proper digital library application is not used. In any case, the most critical issue is the readiness of the partner to dedicate some work and/or to appoint a knowl-

edgeable person to work with us; it seems that this is why a number of institutions who are eager to cooperate with us do not obtain concrete results. The very good example of successful cooperation via OAI is the Heidelberg University Library outside of ENRICH, but many direct ENRICH partners also go this way, e.g. national libraries of Italy (Florence) and Spain, or Cologne University Computer Science for the Humanities as administrator of several German digital libraries.

The institutions with some digitized materials, but without their web digital library presentation are adapted for the use of our software tools that support the Manuscriptorium compatible description and structuring, the output being an XML file in compliance with the prescribed DTD. The old tool is a standalone application called M-TOOL, which creates a short description with a structure pointing to its image representation for each page, usually on a partner server. It facilitates the automated creation of links to several quality levels of images representing each page incl. the covers and the spine. The tool enables the basic validation of the file and the basic preview and checking of availability of referenced images. The XML file output is to be uploaded into the so-called Manuscriptorium for Candidates in which the partner receives a personal password-protected space.

In this space he can look at the whole document as if it were in the Manuscriptorium itself and possibly correct errors or missing pieces of information. Each partner has a physical person on our side (National Library of the Czech Republic) that is responsible for the correctness of the partner's input. The environment provides the opportunity for both parts to maintain a dialogue consisting of checking and corrections through to the final approval when the file is proposed for upload, which is the work of the technical administrator (AiP Beroun Ltd.). The first institution fully using the M-TOOL outside of the Czech Republic is the National Library of Romania in Bucharest. Even if it is not a direct ENRICH partner, it is one of the most active Manuscriptorium partners of all.

The standalone application has some drawbacks, the most important of them being the problematic support of UNICODE and limitation of the descriptive part to a very basic record; therefore, within the ENRICH project the M-TOOL ONLINE is being prepared to support the self-authoring process and the new TEI P.5 enrich.dtd.

The basic conditions for cooperation with Manuscriptorium have been described in one of the project deliverables [2].

#### **4. Using Manuscriptorium**

The goal of Manuscriptorium is to provide a service that is comfortable for users,

which prevents them from: going from one historical library to another, asking for permissions and undergoing difficult access procedures, spending money, having various unavailability problems, etc. With Manuscriptorium, they can concentrate on their research work because the digital library clears up all of these problems for them, and it delivers all the necessary data in the same way under a uniform interface, indifferently of how one works with a concrete remote resource.

Even if it does no more than simply bringing together all the cooperating remote resources, it is a great service. However, it is wise to try to understand the user requirements.

The main Manuscriptorium user is defined as a researcher of manuscripts or old printed books; therefore, the presentation tools should meet most of his/her needs. This is not only about imaging, but also about some added value Manuscriptorium can provide with special tools in search, evaluation, and use of digital objects.

One of the possible added values is certain support in user orientation in such a rich multilingual environment created in Manuscriptorium. The problem is rather difficult because we have the language of descriptions in parallel; that is, modern language with certain exceptions when this is done in Latin (for some Latin manuscripts from some collections) and the language of original documents in titles and cited explicit or incipit fragments, or partial texts in metadata together with the language in full texts in case they are provided. In this way well-standardized modern language appears with various historical stages of the same language with less-standardized grammar and various historical forms of the same word with its spelling developing over time. Another problem is also the transcription of other than Latin characters; even today the transcribed languages in Manuscriptorium are Old Slavonic, Greek, Arabic (and Persian), and various Indian writings. Such transcriptions are made following various international and national (local) systems; therefore, their compatibility may be rather low for the same language, and furthermore, these are made by people with various degrees of knowledge of the document language.

Knowing this, linguistic assistance may perhaps be of some use when targeting the modern languages where applied and to a certain extent some European languages where good dictionaries exist. As for the tests done today, it is possible to say that the user will have linguistic assistance for a number of languages in translation of searches and results. Keeping in mind all that has been said above about the linguistic variety in Manuscriptorium, it should be recognized that such assistance will only be of limited extent and depth. On the other hand, the professional user will hardly need it because he/she is knowledgeable in the languages, their evolution, spelling, and graphic representation for the group of documents he is interested in.

Another user-oriented idea is to assist the user to combine the data as he needs it for his future work, i.e. to extract from the whole richness of the digital library only those data that are necessary for his work. The question is only on what level will he/she be allowed to manipulate them: on the document level or also on the level of any analytical digital object (usually a digitized page of a manuscript)?

We foresee to allow both in the framework of the so-called user personalization workpackage. It is rather evident that it will be useful to enable the creation of virtual libraries with many selection criteria, be they the ownership, provenance, language, culture, etc.

On this level, two approaches on how to virtually create individual partial digital libraries have been developed. The goal is always the same: to give the user the opportunity to select the documents or data and to work only with them. We foresee – and have already the mechanisms to do so – to allow two ways for such a creation: static and dynamic.

The static individual library is created on the basis of searches and their modifications through adding or deleting concrete documents that are not needed or that were not returned because incompatible metadata filled in the elements searched. For example, we have quite a good deal of Persian manuscripts in Manuscriptorium: most of them are from the collections of the National Library of the Czech Republic and the University Library of Bratislava (Slovakia), but there are several dispersed items in smaller local museums that are hardly returned through global searches based on the application of some evident search terms. Such individual documents can be added manually and can form a stable static virtual collection of Persian manuscripts within Manuscriptorium. We are thinking of the creation of such local collections directly as administrators because they will surely help users to be better oriented in the whole digital library.

The dynamic individual library is created as a return of hits based on a permanent refined query. The advantage is that such a library is growing dynamically any time when newly added items comply with the search terms profile. The disadvantage may be that for a well-shaped partial library sometimes the manual addition of several items would be needed. However, this is not excluded.

The next step is the creation of tools for the virtual library based on user manipulation with individual objects, i.e. with individual pages from any document in order to use them for the creation of a virtual book, consisting of objects taken from a greater part of digitized originals indifferently of their physical location. It is believed that this could be a good opportunity for activities such as learning and teaching, or making comparative studies based on the manuscript contents.

The Manuscriptorium Digital Library is harvested by The European Library (TEL) on the level of description records (Dublin Core). The European Library is being considered to be the metadata aggregator for Europeana so that any institu-

tion sharing its data with others in Manuscriptorium is accessible via these European services; in this way, its visibility gets a considerable added value. When a Manuscriptorium document is found in TEL, the user can navigate directly to its record in Manuscriptorium, while the accessibility of its digital representation depends on the willingness of the source institution to let them be freely accessible or under Manuscriptorium license. Manuscriptorium respects the wishes of content holders in this point because many of them prefer the filtering of users through licensing, which gives more safety to the sensible data.

The world is divided here in two groups: one of them requires free open access, while the other one licensed open access. The income from licences is currently far from covering the Manuscriptorium operational cost that is fully carried by the National Library of the Czech Republic with funds from the Czech Ministry of Culture, the main reason being that it is a good and rich service for the Czech user community. From this point of view, the sustainability of Manuscriptorium is a problem rather similar to sustainability of larger portals such as TEL or Europeana.

The sustainability cost has two important chapters: operational cost and cost for research and development. The RD funds allow fast growth of the quality of the service, and they have been available mostly through national projects and in a way also through international projects. They are needed permanently, but from time to time big quality changes need special funding to make everything right. This happens today and after that, the operation of the service will have to be maintained including reasonable update and aggregation of new data from new partners. A stable non-problematic model has not yet been found here. The reason for this may also be due to the fact that Manuscriptorium contains data from big rich institutions, as well as from small or very small content owners, while the scientific value consists in the aggregation of them all. We would not like to see a business model let these smaller cultural institutions go away from us.

Related to this, there is another issue that many researchers and institutions do not like to touch properly. Even if most of the Manuscriptorium documents are copyright free as originals, there are many handwritten materials that are published for the first time as works in Manuscriptorium or also in Manuscriptorium. In this case, a person or a legal body who publishes an unpublished manuscript/work for the first time ever gets the copyright for twenty-five years; we are sure we provide access to a lot of such works in Manuscriptorium. Furthermore, the electronic document produced from the original analogue document has its own copyright, as the data have their owner who has created them.

This is a rather sensitive point and it is not properly understood by those who translate the concept of *open access* into *free access*. Manuscriptorium has a great deal of problems with such users and even with some potential contributors. To

avoid misunderstandings and to have clearly distributed roles in cooperation, a set of agreements is signed when a new contributing partner joins the Manuscriptorium community. The first one is the License Agreement that states that all the shared data remain property of the contributor; while Manuscriptorium, represented by the National Library of the Czech Republic, gets only the right to handle the data for presentation purposes in Manuscriptorium. Without additional consensus the contributor's data can be only used as samples for further promotion of Manuscriptorium. This License Agreement is followed by the Sub-License Agreement through which the contributor gets the right for full access to everything in Manuscriptorium on all his computers on the basis of provided IP address(es) or their range. This way the Manuscriptorium partners and their users have access to everything. The institutions or researchers that cannot or do not want to go this way can purchase a license based on an annual fee (150 EUR for institution and 75 EUR for a private individual). This fee is more or less on the level of subscription of a normal journal, and we are sure that its amount is not critical, as it is not in other areas of human activities when the need for information is felt as inevitable.

It is interesting to see that such a behaviour and copyright clearance for electronic images of old documents is clearly understood by UNESCO when they want to use materials, for example, for their website or publications; while many Europeans have difficulties in understanding this correctly.

## **5. Conclusions**

Manuscriptorium is developing towards an important aggregator of data for manuscripts and a part of other rare historical documents in Europe. It is implementing modern technology and modern methods of descriptions of manuscripts that are based on the latest research requirements and thinking. It offers a vast environment for work and it also offers the opportunity for newcomers in manuscript digitization to go quickly on-line, provided they agree with its principles.

The TEI format together with the transformation tools will allow the libraries to also get the catalogue data in MARC format, when it is required for current library catalogues. Of course, the usage of MARC versions differs in their interpretations for old documents from one library to another; therefore the transformations should be tuned individually on demand if needed.

Another important point is to realize that Manuscriptorium is different from the usual standard digital library approaches. This is given mostly by the character of its content because manuscripts are more complex than printed books; therefore, their virtual research environment requires more flexible tools and basically

also a richer description format.

However, the most difficult Manuscriptorium challenge remaining is its sustainability; we are convinced that with the expansion of its service the chances of solving it will grow. We are still continuously receiving more new interests in sharing data with us. We hope this trend will also continue after the ENRICH project comes to an end in November 2009.

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