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DIGITISATION OF THE MAP COLLECTION OF THE FACULTY OF SCIENCE, CHARLES UNIVERSITY, PRAGUE

Abstract

The paper introduces the procedures and methods on digitization, the access and archiving of the Map Collection at the Charles University in Prague. The methodologies for the description in MARC 21 were created first. Through the cataloguing process 58,000 bibliographical records were created and 90,000 units were attached. Additional metadata were generated from MARC xml, technical metadata according to the MIX norm and the descriptive ones as a metadata package METS. An external firm carried out the digitization, which was accompanied by a number of problems that had to be addressed. The control of the image and also of the metadata and their linking and copyright monitoring took place in the Map Collection. Metadata were exported to other systems as a union Catalogue of the Czech Republic (52,000), GEOBIBLINE database (214,000). Metadata with attached images were then exported to the Digital University Repository (58,000) and to the Digital Map Collection portal (65,000). The aggregation to the National Digitization Registry, to the Old Maps portal (30,000), to the Oldmapsonline portal and to the eCollections and then to the Europeana were important. Georeferences are linked with the Central Catalogue of the Charles University. The globes and models are also made accessible. Separate portals of the important Czech cartographers with full texts were created after the conclusion of license agreements. E-learning courses on old maps were also organized.

Keywords: cartographic materials, old maps, digitalization, access, GEOBIBLINE, Czechia

INTRODUCTION

The cartographic cultural heritage still ranks among the most endangered ones as its processing remains outside the scope of the main priorities for many institutions. We understand the cartographic cultural heritage as a culture of the past perceived and experienced at present, mingling with *cartography* and creating the *cartographic heritage*[1]. Documentary heritage includes a significant or lasting value for humankind[2]. The Map Collection of the Faculty of Science of Charles University in Prague, which owns and manages an important collection of this type of cultural heritage, has been given an opportunity to describe, digitise and make available its resources as part of the programme of the Ministry of Culture of the Czech Republic.

ABOUT THE MAP COLLECTION

The Map Collection of the Faculty of Science was established in 1891 together with the Geographical Institute of Charles University. After the foundation of Czechoslovakia (1918), it acquired the status of the State Map Collection and became a national collection. It also acquired a part of the war archives in Vienna (about 30,000 map sheets) and made other important acquisitions[3]. Its founder professor Václav Švambera published a series of old maps of the Bohemian territory called Monumenta Cartographica Bohemiae[4]. After World War II, it acquired cartographic monuments from numerous castles confiscated by the Germans, the Map Collection of the National Museum (about 20,000 map sheets) and the National Library. In 1953–1993 it formed part of the Czechoslovak Academy of Sciences and then it was returned to the original owner, i. e. Charles University.[5] Since 1914, the collection had occupied one collection hall of 21 x 6.5 m in a neo baroque building at Prague Albertov. It has always been there until today, which is one of the great rarities of and benefits for the collection itself. The historic interior was sensitively refurbished (2011–2013). The collection used card catalogues, which did not correspond to signatures any more. The new description has been created since 2010.

1 Evangelos Livieratos, "New Perspectives for Expanding the Concept and Context of Cartographic Heritage in the Digital Domain". In *9th International Workshop on Digital Approaches to Cartographic Heritage, Budapest, 4-5 September 2014,* edited by *Maria* Pazarli *(*Budapest: Commision on Digital Technologies in Cartographic Heritage, 2014).

2 Ray Edmondson, *Memory of the World: General Guidelines*. (Paris: UNESCO, 2002), 2.

3 Eva Novotná, "Mapová sbírka v proměnách času". In: Novotná, Eva, Mirka Tröglová Sejtková a Josef Chrást. *Poklady Mapové sbírky,* (Praha: Karolinum, 2016), 6.

4 Václav Švambera and Bedřich Šalamon, *Monumenta Cartographica Bohemiae* (Praha: Sumptibus propriis, 1938).

5 Eva Novotná, "Mapová sbírka v proměnách času", 11–12.

COLLECTION CONTENT

The collection is valuable in terms of its content and scope within the Czech as well as Central European context. It contains 130,000 map sheets, 3,500 atlases, 85 globes and other special documents such as geomorphological models, graphics and photographs. About a third of the resources are old cartographic prints before 1850. The collection is universal. It contains both regional topographic map series and a wide range of thematic maps. Valuable are, for example, the collections of de Witt and Gijbertson's wall maps or Dutch atlases from the 16th and 17th centuries. The oldest collection atlases include Ptolemaios' edition of 1520. There is also *Theatrum Orbis Terrarum*, Ortelius's atlas published in Antwerp in 1570. Moreover, there are Mercator-Hondius atlases (1633), Janssonius-Blaeu's 11-volume *Atlas maior*, published in Amsterdam (1658). The oldest dated maps show plans of Rome – be it either Tramezzino's Urbis Romae of 1552 or Lafreri's Rome of 1557. The most valuable map images include original map manuscripts of the 3rd military mapping for the Czech lands. The oldest maps of Bohemia by Klaudian, Criginger, Aretin, Vogt or Müller are of great national importance. The rich collection includes plans of Prague and other Czech and European cities (including Belgrade). A collection of 85 globes is also interesting. The most valuable ones are by Willem Janszoon-Blaeu of 1599 and Jodocus Hondius of 1613. Unique is also a pneumatic globe by Philipp Cella of 1831, with the inflated diameter of 113 cm. The complete set consists of globes from the Czech manufactory of Jan Felkl & son, whose collective exhibition was organised by the Map Collection in 2017[6]. The oldest monograph of the resources is Münster's cosmography (1578). However, some rare maps were identified only after they had become available through the Internet, thanks to the international collaboration of specialists.

COLLECTION DESCRIPTION

The digitisation was preceded by the description of the collection. The problem was that no one in the Czech Republic had ever processed such a large collection of maps before. For comparison, the National Library of the Czech Republic made descriptions for 14,000 more recent maps. That is why methodologies according to RDA rules in MARC21 were prepared at first – from the description of atlases, globes, 3rd military mapping to great methodologies for the processing of old cartographic monuments and manuscripts and new cartographic works. [7] At the same time, it was necessary to process a relevant number of works. At the time of

6 Eva Novotná, *Jan Felkl & Syn: továrna na glóby = Jan Felkl & Son : A Globe-Making Factory*. (Praha: Univerzita Karlova, 2017), 5.

7 Eva Novotná, *Certifikovaná metodika pro katalogizaci kartografických dokumentů podle RDA* (Praha: Univerzita Karlova, Přírodovědecká fakulta, 2014).; Eva Novotná, *Certifikovaná metodika pro katalogizaci starých kartografických tisků a rukopisů podle RDA v MARC21* (Praha: Univerzita Karlova, Přírodovědecká fakulta, 2014).

the project, it was necessary to make descriptions for 11,000 maps or atlas sheets. Descriptions were made in the Aleph library programme. Great emphasis was placed mainly on fields 034 and 255 for mathematical cartographic data, but also on factual description, subject headings and especially on geographic authorities. An extensive set of special formal descriptors for cartographic materials has been created for the National Library. This set has been implemented and is now being used by other libraries as well. In 2011–2015, three cataloguers were making the description of the material. The checks were made manually in the collection and automatically when importing the data into the Union Catalogue of the Czech Republic. [8]

ACCESSIBILITY OF DESCRIPTIVE METADATA

In 2017, 100,000 units and 60,000 bibliographic records were available from the Central Catalogue of Charles University[9] (in the Czech-English interface). The metadata has been exported to the Union Catalogue of the Czech Republic and to GEOBIBLINE[10], the online Geographical Bibliographical Database of the Czech Republic. Descriptive metadata has been generated from the catalogue to other systems.

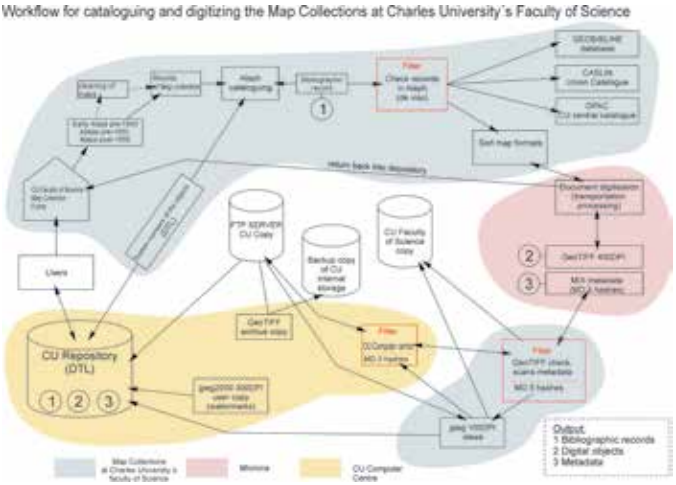
DIGITISATION

Digitisation was a rather complicated process provided by an outsourced company. However, great demands were placed on local worksites when processing and preparing the materials, and in particular during the backtracing of the data. In fact, it was necessary to prepare 1,500 maps and atlas sheets per month. Various types of documents were approached differently during preparation. This meant not only to describe them, but also to prepare identifiers, bar codes and separate numbers of scanned-sheets, which was particularly difficult for atlases. It was imperative to ensure that maps were freely available and not bound by copyright. It was necessary to prevent duplications of maps and indicators. At first old cartographic prints (before 1850), manuscripts, rare maps and then also more recent, newer prints published before 1945 were selected. At the same time, licenses with heirs for more recent works were arranged for.

8 http://aleph.nkp.cz/F/55NSS9N3RI8Y93V7TB3RNNLHFQFA6HJAG4KS5KNSDKB-FV571J6-10915?func=short-0&set_number=083375&CON_LNG=ENG

9 https://ckis.cuni.cz/F/DUP578NX8KJ891E7MBSUIVD558XMNGCQBGKTQTREJ1CF52D-P3X-50051?func=file&file_name=find-a&CON_LNG=ENG

10 http://www.geobibline.cz/



Digitisation Scheme in the Map Collection of the Faculty of Science, Charles University. (Source: author)

Apart from images in the GeoTIFF format, the contractor also created technical metadata in the MIX[11] standard (version 2.0), which included mandatory and other nested elements. This metadata was processed in Exiftool. The name of the MIX file was always identical with the name of the GeoTIFF digital image file.

DIGITISATION CHECKS

After returning from the digitisation process it was necessary to physically check the maps and deposit them, compare the MIX technical metadata and the number of rasters that had to match. The raster quality was evaluated and multi-part map and atlas folders were viewed. Subsequently, complaints were sent off. The correct files were then exported to the server of Charles University. After that, they were stored in the university repository, and relevant METS[12] packages were created, which were manually matched with bibliographic records. One employee always spent a month doing the processing, preparation and repair activities. Collaborators helped with map filing. The maps were selected for digitisation and prepared according to predefined criteria by the cataloguers during processing.

11 http://www.loc.gov/standards/mix/

12 http://www.loc.gov/standards/mets/

ACCESSIBILITY OF CARTOGRAPHIC CULTURAL HERITAGE

The first maps were made accessible from the University repository through the Digitool programme. The rasters were connected from the Central Catalogue of Charles University. The existing storage and projections were seen as provisional from the beginning of the project, as the repository was not primarily intended for showing maps or spatial information. Although the Trusted Repository status (Seal of Approval)[13] was obtained at the end of 2015, and although the geographic search interface was put into operation and the number of the displayed repository objects raised to nearly 500,000 in 2015, intensive programming works on the creation of a new separate metadata catalogue were ongoing, in order to make possible what the university repository was not able to provide: namely, fast and detailed map projections, metadata editing and searching, working with interactive maps, and efficient work with spatially referenced data sources.

Custom programmers developed an open source web application for managing and accessing cartographic documents, which was based on the mutual integration of Geonetwork[14] (metadata catalogue), PostgreSQL[15] (database system) and Geoserver[16] (map server) tools. It was to allow the metadata conversion between MARC21[17]and ISO 19139[18] standards which was also dealt with methodologically[19]. The planned system included digital data repository for permanent data storage and protection as well as its long-term accessibility.

The most important endeavour has been to complete this metadata catalogue and make it available for map presentation on the Digital Map Collection portal[20].

Here, 65,000 maps and atlas sheets are available in nearly 29,000 collections in very high quality, i. e. in 300 DPI jpeg2 with minimal compression. The home page offers basic search with map previews and titles. They are listed according to either up-to-datedness or popularity. It is also possible to browse through previews and headings. Full text search is also possible – by title, author's data, or subject matter headings. Metadata details can be viewed in the Central Catalogue of Charles University in several bibliographic formats and citation outputs. Maps and metadata can be downloaded or shared on social networks. GeoNetwork also offers an important option for logged-in users, namely modification of existing metadata or creation of new ones. Non-authorised visitors can view and download data in ISO19139. The interface has been translated into the Czech language and, besides English, offers also other language versions.

13 https://assessment.datasealofapproval.org/assessment_184/seal/pdf/

14 http://geonetwork-opensource.org

15 https://www.postgresql.org/

16 http://geoserver.org/

17 https://www.loc.gov/marc/bibliographic/

18 http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=57104

19 Lukáš Brůha, Certifikovaná metodika pro tvorbu metadat kartografických dokumentů (Praha: Univerzita Karlova, Přírodovědecká fakulta, 2014).

20 http://www.mapovasbirka.cz/geonetwork

AGGREGATION TO HIGHER UNITS

Aggregation to higher units was also necessary. Just one map on one map sheet was exported to the staremapy.cz[21] portal, which allows for interactive map geo-referencing by the public[22]. From there, they continue to the world map collections – oldmapsonline.org[23] portal. Another export was done to the National Digitisation Register[24]. Import was done to another international portal called Europeana[25] through the e-collection[26] portal of the National Museum.

21 http://staremapy.cz/

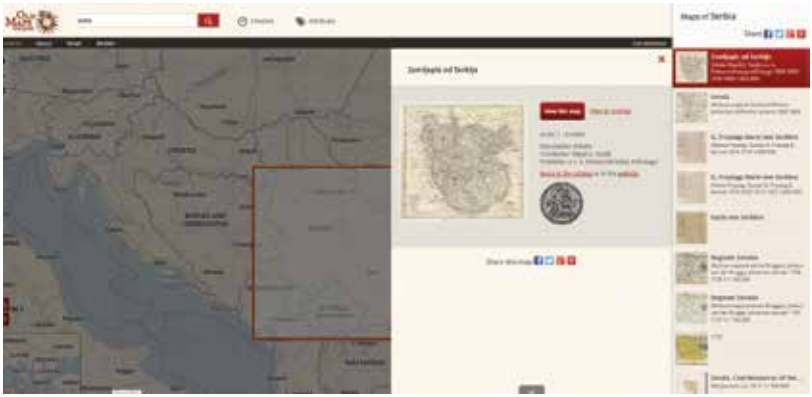
22 Renata Šolar, "Map Libraries. Challenges for the Future", *e-Perimetron* 11, no. 2 (2016): 91.

23 http://www.oldmapsonline.org/

24 http://www.registrdigitalizace.cz/rdcz/search.jsp?offset=0&hits=20&collapseBy=CNB&sortby=&f1=&f2=&sortdirection=&q=&title=&autor=&rok=&isxn=&ccnb=&signatura=&carKod=&cisloRDCZ=&pole001=&cisloZakazky=&archCisloNeg=&nav=personnames%3A%5E%22Mapov%C3%A1+sb%C3%ADrka+P%C5%99F+UK+v+Praze%22%24

25 http://www.europeana.eu/portal/en/search?f%5BCOUNTRY%5D%5B%5D=czech+republic&f%5BDATA_PROVIDER%5D%5B%5D=Mapov%C3%A1+sb%C3%ADrka+P%C5%99%C3%ADrodov%C4%9Bdeck%C3%A9+fakulty+UK+v+Praze

26 http://en.esbirky.cz/search/quick/results?keywords=mapov%C3%A1+sb%C3%ADrka&order=relevance#googtrans(en)



OTHER SERVICES

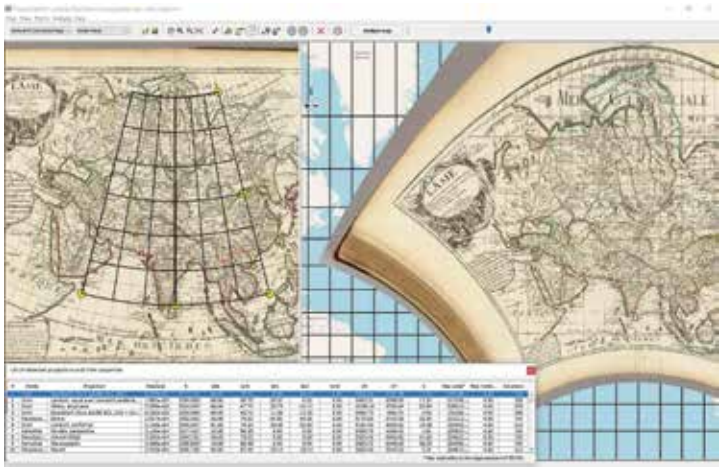
Digitised collections can also be rearranged, for example by centuries or cartographic schools, and new sub-collections may be created[27]. The sub-collection of globes[28] and models of the Earth and structures[29] in the digital map collection may be used as an example. Furthermore, there are full texts and maps of Czech cartographers based on license agreements: the websites of K. Kuchař, L. Mucha and J. Janka. E-learning courses have been developed: Old maps: digitisation and cataloguing tested on students of the Faculty of Science and the Faculty of Humanities of Charles University. Digitised exhibitions have been made available as well. Software and website for the detection of unknown cartographic projection by T. Bayer[30] are being promoted.

27 Jelena Glišović and Stanislava Gardašević, "Cartographic Collection of National Library of Serbia throughout History until the Digital Present", *e-Perimetron* 10, no. 2 (2015): 82.

28 http://www.mapovasbirka.cz/globy/english/index_eng.html

29 http://www.mapovasbirka.cz/models/english/index_eng.html

30 https://sourceforge.net/projects/detectproj



The Digital University Repository of the Faculty of Science displayed 460,000 map objects in 2016. This year, 52,000 searches[31] have been made in the Digital Map Collection. Under the license agreement, digital copies in tiff are provided free of charge for study and scientific purposes. The license fee is charged in the event of publishing.

PROS AND CONS OF ONLINE ACCESSIBILITY

What are the pros and cons of digitisation and mapping? Benefits include international availability 24 hours / 7 days a week, as well as multiplicity of maps and new users that enable us to identify rare maps in the collection. Thus, a rare map of F. Camocio dating back to 1565 has been discovered and nominated for MoW UNESCO. And other, on the global scale rare maps have been discovered such as de Wit's map of Germany or Gijsberts's map of Europe. The resources are protected and may remain in guarded repositories. On the other hand, increased license agreements-related paperwork has been noticed, as well as ongoing demands for maintenance and software updates, server checks, stored data lifetime and migration. Issues with searching for maps at publishers' atlases that have been registered as a whole are also problematic. Finally, our students are still searching for maps mainly from Google without entering our university or other catalogues. And after the project completion, the collection lacks funds for further processing of the resources.

31 Eva Novotná, "Czech portals for visualisation of Cartographic culture heritage". In *Proceedings 12th ICA Conference Digital Approaches to Cartographic Heritage, Venice, 26-28 April 2017, edited by* Evangelos Livieratos (Thessaloniki: Aristotle University of Thessaloniki, 2017), 202.

CONCLUSION

The map collection has been professionally described and metadata for 60,000 bibliographic records and 100,000 items have been created. Digitisation has made 65,000 maps and atlas sheets available. The Map Collection of the Faculty of Science, Charles University, was able to create an open source well-functioning GeoNetwork catalogue with Czech and English search interfaces.

Digitisation has contributed, in particular, to archiving, protecting and potentially saving the cultural heritage, to permanent international multiplicity map accessibility, immediate downloading of previews (without watermarks) and, last but not least, to the discovery of new rare collection items, leading, among others, to UNESCO's MoW nomination.

It has also brought about new commitments, tasks and activities such as constant server monitoring, programme updates, data migration, and other.

Aggregation has been done to the following portals: Staremapy.cz, National Digitisation Register, e-collection, Oldmapsonline.org and Europeana, allowing for a wider presentation of the collection at home and abroad.

In addition, globes and Earth models have been made available, as well as cartographers' websites, old maps e-learning, electronic exhibitions and software for the detection of unknown cartographic projection.

In 2016, the Digital University Repository of Charles University made 460,000 map objects accessible and the Digital Map Collection showed 52,000 searches.

The digitisation project and accessibility of cartographic cultural heritage in the Map Collection of the Faculty of Science, Charles University, has been successful, but due to the fast development of technologies and services related to map searching, the services need to be continuously improved.