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Map Libraries - Challenges for the Future

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Summary: The Map & Geoinformation Curator Group - MAGIC, representing Map Libraries, Map Archives, Map Collections and relevant entities dealing with cartographic material of analogue and digital type was founded in 2014. Its roots go back to 1978, to Copenhagen, where 18 participants from 9 European countries decided to establish a permanent Group of curators of public map collections. Since then, map curatorship experts from GLAM institutions all around Europe have been organising biennial conferences to discuss key tasks referring to the development of collections, such as access and preservation of analogue and born digital maps and atlases, digital collection development, new services and new technologies, meta data models and data-exchange standards. As a result of the boom in digital cartography, the cartographic collections have in recent years endeavoured to convince the wider professional public to acknowledge the necessity of continued existence of the Map Collection, especially in the national libraries. The usage of digital technologies enabling the most effective representation and access to cartographic heritage is urgent for survival of cartographic collections that support many educational and research processes and reach a wide range of end users. The paper will present the most acute issues functioning of map collections, based on contributions from last conferences.

Introduction

The Map & Geoinformation Curator Group - MAGIC, representing Map Libraries, Map Archives, Map Collections and relevant entities dealing with cartographic material was founded in 2014. Its roots go back to 1978, to Copenhagen, where 18 participants from 9 European countries decided to establish a permanent Group of curators of public map collections. The next meeting was held in Paris in 1980, at the National Library of France. The participants decided that *Groupe des carto-thécaires* (GdC) would be a section of the *European Association of Research Libraries - LIBER (Ligue Européenne de Bibliothèques de Recherche)*; the Group operated under its auspices till 2012. On biennial conferences map curatorship experts from GLAM institutions were discussing key tasks referring to the development of collections. The last conference of the LIBER *Groupe des carto-thécaires* was held in Barcelona in 2012, gathering 62 participants from 21 different countries. Map library management depends upon mission, vision and strategy of domicile institutions, i. e. the type of a library (national, academic, public, research, special) and upon the subject matter of its existence – maps.

Dramatic development of digital cartography that expands the conceptual definition of the map (Real/Virtual Map, Deep/Surface structure, (Moellering 2007)) have changed understanding, workflow and standard activities of map libraries: collection development, bibliographic control, patron use and archiving/preservation. This has pushed map libraries in a special position of searching a newly-defined identity, as evidenced by topics of recent conferences (Moore 2008; Bracke 2010; Montaner 2012): Positioning of Map Libraries in the (geo)-Information Society (Ljubljana, 2014), Map libraries in a Changing World (Barcelona, 2012), A Map Library as the Centre of Cartographic

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Information (Tallin, 2010) and *The Future of the Map Library and the Map Librarian* (Amsterdam, 2008).

The usage of digital technologies enabling the most effective representation and access to cartographic heritage is urgent for survival of cartographic collections that support many educational and research processes and reach a wide range of end users. Meta data models and data-exchange standards must follow the users' requirements for the most efficient, precise and multi-layered search results. Accessing and preservation of born digital maps and atlases are particularly urgent issues that require definitive answers.

The article presents the above-mentioned activities of map libraries through presentations at recent conferences.

Digital collection development, new services and new technologies

Since the end of 20th century, mass digitization projects of cultural heritage in libraries, archives and museums, through which a large quantity of digitized maps have been formed, mostly in the form of static images, are entering a new phase of their transformation – they are becoming dynamic and interactive objects, with new added value, which enables further in-depth research.

Georeferencing of historical maps has become an imperative standard for digital map collections. It offers a number of important advantages for libraries and archives, such as comparison/overlay with other maps and spatial data, delivery through better or more familiar interfaces, new ways of understanding the content of early maps.

The first georeferenced maps in the European GLAM institutions were made available via the homepage of the Moravian Library in 2009 as the result of the initial development of Georeferencer, an online tool authorized by Klokan Technology. In 2011, the pilot project was expanded again through the TEMAP Project, which resulted in the Georeferencer technology being extended to two other institutions in the Czech Republic: Masaryk University and Charles University in Prague (Fleet et al. 2012). The National Archive of the Netherlands implemented Georeferencer in October 2010. 650 polder maps of South Holland were georeferenced in less than one month by a team of ten volunteers. At the same time, 1,000 early maps of Scotland from the National Library of Scotland (NLS) Map Collection were georeferenced as well. A wide variety of maps were included —county maps, town plans, coastal charts, and estate mapping, dating between 1580 and the 1920s. (Fleet et al. 2012). With upgraded version of Georeferencer at NLS in 2012, a further 200 maps have been georeferenced. NLS improved user access to online historical maps also through projects: Historical Maps API, which allows anybody to embed a zoomable georeferenced historic map of Great Britain in his own website and Visualising Urban Geographies, which combines geo-referenced maps with historical information. The British Library began a project to crowdsource the georeferencing of its scanned historic mapping in 2011 by partnering with Klokan Technologies to customise its online georeferencing tool. In total over 8,000 maps have been georeferenced, in five public releases since 2012. The most recent release, of July 2014, consisted of 3,220 maps extracted from 19th-century digitized books. The images were posted to Flickr Commons in December 2013, and were then tagged by the public, including identifying those that were maps. This collection therefore represents a great deal of public interaction (British Library's Georeferencer project 2015).

In addition the Cartographic and Geologic Institute of Catalonia (ICGC) has georeferenced large amounts of digitized historical maps by using of georeferencer and crowd sourcing projects. In May 2012, 1,000 early printed and manuscript maps and aerial photographs were georeferenced in less than

20 days by 80 volunteers. Currently the map library collection showcase almost 2,000 maps georeferenced by crowdsourcing (Roset et al. 2015).

The map library of ICGC presents a complex and all dimensional operation of special map library. Privilege (viewed from the perspective of other types of libraries) of being an integral part of the Cartographic Institute enables efficient and effective development from the classical analogue library to the geographic information centre. The Library satisfies all aspects of current users' request, and enriched access to digitized and georeferenced historical maps and photos with digitized atlases, books referenced to geography and cartography and archives. The Library is also an integral part of the Spatial Data Infrastructure of Catalonia (IDEC) with 3,462 maps coming from 4 public map collections. Spatial Data Infrastructure (SDI) is used for searching, locating, finding analysing and linking with the geoinformation and geoservices which are integrated in the IDEC's network (Roset et al. 2015). It is a basis for discovering spatial data, its evaluation and its use by different kinds of users, either from public, business, academic, government or citizens sector.

The display of results and navigation has been recognized as some of the biggest issues in bibliographic information systems. Outdated user interfaces and cumbersome usage of library catalogues have been often criticized over the years. Searches for cartographic materials using conventional library text-based OPAC proves to be inadequate. The queries have to be formulated in words and furthermore, indexing based on geographical names does not adequately describe the spatial dimension of cartographic material, and geographical names also tend to be ambiguous and inclined to change (Oehrli et al. 2011). A web-based geographical search system (geosearch) seems to be an appropriate solution. The geosearch, which analyses the geographical coordinates of MARC21 field 034, has been developed for the Swiss research portal for maps from libraries, archives and federal institutions in Switzerland - Kartportal. In Switzerland, the idea of making maps easier to find with the help of geographical coordinates has been discussed since the Swiss translation of the ISBD(CM) in 1986. The recording of coordinates was made obligatory in 1995 and is considered a key factor in the success of the geosearch in the national map portal (Oehrli et al. 2011). The map search uses data from the Swiss metacatalogue *swissbib*. It is based on the software MapRank Search, developed by Klokantec Technologies. *MapRank Search* technology serves as the base for the *OldMapsOnline* Portal, an easy-to-use gateway to several thousands of historical maps from 21 libraries around the world.

Spatial access to cartographic heritage also provides *CartoMundi*, a website with an international collective catalogue (CartoMundi 2015). The Mediterranean House of Social Sciences (Maison méditerranéenne des sciences de l'homme) has developed a collective open network catalogue, which homogenizes the referencing of key maps, and in particular the multi-sheets series through the contribution of libraries using interactive graphic index. It is a useful system to gather scattered cartographic information and it also allows data exportation and importation. The system does not replace existing catalogues, it supplements them with the added possibility of managing documents from the areas they represent.

CartoMundi is devoted to the promotion of the cartographic heritage that was primarily conceived for librarians, scholars and students. It facilitates smoother relations between map users and institutions who hold them, and with the future development it would grow as a portal towards a range of functionalities (Arnaud 2008, 2014).

With the aim to enhance the technical treatment of digitized map sheets and in order to increase the usage of cartographic heritage for research and educational purposes (and bridge financial gaps) many national map libraries have been looking for collaboration projects with universities. The City Library of Berlin (Staatsbibliothek zu Berlin) has been cooperated as a content provider with academia and

regional survey bodies within three projects in the recent years: 1) The Digital Wenker Atlas - enables a comparison of linguistic maps of Germany around 1900 through implementation of layer techniques; 2) the creation of seamless maps of the topographic survey of Saxony freely available in the digital Atlas of Saxony and 3) georeferenced maps of the first Prussian survey by Schmettau (1767-1787) for the identification of the wooden areas (Crom 2014). As well the Map Department of the National Széchényi Library in the cooperation with several Hungarian Universities has been trying to transform itself to the geo-information and reference centre (Kiss et al. 2015).

On the other hand the university map libraries with their cartographic corpora support educational courses and research activities and offer different facilities to academia for consulting digital maps through internal and publicly available databases, portals and platforms.

Photographic materials as geographic documentation emphasized the importance and the wealth of aerial photographic collections stored in the libraries. »Denmark seen from the air – before Google» is an application from The Royal Library showcasing aerial photos captured above Denmark from the year 1923 and onwards. The original metadata were not sufficient to secure a precise geo-coordinate for the individual photo so the public was involved as a means of securing location (Dupont 2012).

Wageningen UR Special Collections holds several collections of aerial photographs as well. Two collections are digitally available: The RAF Aerial Photographs from 1943-1947 and The Grebbelinie from 1939. The RAF Aerial Photographs are available via the Wageningen UR Geoportal. Photographs could be explored in a geographical context by searching an area in the map or by location, flight data, flight number or pilot name (Verhelst and Missel 2012).

The excellent example how the map library has been the focus around which all subsequent investigation has been concentrated, leading the drive for future co-ordinated research, conservation, publications, and a possible travelling exhibition was the research of the Gough Map, coordinated by map library of the Bodleian. The Gough Map of Great Britain is one of the Bodleian Library's most significant cultural and cartographic treasures dating from around 1360; the map library was a pivotal in encouraging new multi-disciplinary research on the map's possible history and function. The role of the map library in promoting the Gough Map was: 1) custodian of the resource, 2) identifier of the resource's potential 3) facilitator of the resource's exploitation, 4) networking hub and 5) disseminator of information. (N. Millea 2008).

Cartographic resources descriptions – meta data models

Transformation of traditional catalogues and cataloguing processes through bringing metadata into the wider data universe are essential for the existence of libraries in the digital age.

The International Federation of Library Associations and Institutions (IFLA) is the leading international body representing the interests of library and information services and their users. Over the last fifty years, IFLA has produced a wide range of standards in all fields of library and information services. Each IFLA standard reflects current consensus on rules, principles, guidelines, best practice or models for a particular activity or service.

IFLA generally uses the term 'standards' to refer to the following types of documents:

- Conceptual models
- Rules for resource description
- Digital format codes
- Guidelines (documents consisting of instructions, advice and models of preferred practices)
- Best practice (documents consisting of procedures and techniques based on experience and research) (IFLA 2015).

Conceptual models

FRBR is a conceptual entity-relationship model that relates user tasks of retrieval and access in online library catalogues and bibliographic databases from a user's perspective. It represents a more holistic approach to retrieval and access as the relationships between the entities provide links to navigate through the hierarchy of relationships. FRBR is built upon relationships between and among entities. Relationships serve as the vehicle for depicting the link between one entity and another, and thus as the means of assisting the user to 'navigate' the universe that is represented in a bibliography, catalogue, or bibliographic database. Examples of relationship types include, but are not limited to equivalence, derivative and descriptive relationships. The model is significant because it is separate from specific cataloguing standards such as AACR2 or International Standard Bibliographic Description (ISBD) (IFLA 2015a).

Rules for resource description

International Standard for Bibliographic Description (ISBD) is a set of rules to create a bibliographic description in a standard, human-readable form, especially for use in a bibliography or a library catalogues. One of the original purposes of the ISBD was to provide a standard form of bibliographic description that could be used to exchange records internationally. ISBD(CM) specifies the requirements for the description and identification of cartographic resources (ISBD(CM) 2015; McGarry, 2001).

Digital format codes

MARC standards are a set of digital formats for the description of items catalogued by libraries. MARC formats are national standards for dissemination of bibliographic data. There are several versions of MARC in use around the world, the most predominant being MARC 21, created in 1999 as a result of the harmonization of U.S. and Canadian MARC formats, and UNIMARC, widely used in Europe. MARC transmits information about a bibliographic item, not the content of that item; this means it is a metadata transmission standard, not a content standard. Especially important for map cataloguers was the creation of fields for cartographic resources description, i.e. MARC 255 that gathered scale, projection and coordinates data. The future of the MARC formats is a matter of some debate among libraries. On the one hand, the storage formats are quite complex and are based on outdated technology. On the other, there is no alternative bibliographic format with an equivalent degree of granularity. The billions of MARC records in tens of thousands of individual libraries (including over 50,000,000 belonging to the OCLC consortium alone) create inertia. The Library of Congress has launched the Bibliographic Framework Initiative (BIBFRAME) which aims at providing a replacement for MARC that provides greater granularity and easier re-use of the data expressed in multiple catalogues (IFLA 2015).

RDA, Resource Description and Access, is the new cataloguing standard that has been developed to supersede the widely adopted Anglo-American Cataloguing Rules (AACR2). RDA offers libraries the potential to change significantly how bibliographic data is created and used. This new code is informed by the FRBRF and was conceived to be a framework more flexible and suitable for use in a digital environment. Published in July, 2010, RDA is now available, and certain libraries have started using it for their current cataloguing workflow (Wikipedia 2015).

In relation to the slow response of large associations (for the sake of achieving a consensus of all members) of GLAM institutions in the design and implementation of more flexible and user-friendly formats and standards in the digital environment, various new consortia have created new cataloguing standards.

Dublin Core Metadata, the original set of 15 classic metadata terms (for cartographic resources element coverage defines the spatial topic of the resource or the spatial applicability of the resource), may be used for multiple purposes, from simple resource description, to combining metadata vocabularies of different metadata standards, to providing interoperability for metadata vocabularies in the Linked Data cloud and Semantic Web implementations (Wikipedia 2015). The semantics of Dublin Core were established and are maintained by an international, cross-disciplinary group of professionals from librarianship, computer science, text encoding, museums, and other related fields.

The Europeana Data Model was designed to replace the Europeana Semantic Elements (ESE), the first reference metadata set used to describe cultural heritage objects in Europeana, based on Dublin Core. EDM makes Europeana fit within a networked data environment. The main EDM requirements include:

- distinguishing between a 'provided item' (painting, book) and its digital representations
- distinguishing between an item and the metadata record describing it
- allowing the ingestion of multiple records for the same item, which may contain contradictory statements about it.

EDM data has a level of complexity above that which Europeana currently maintains, and which is comparable to what can be found in the data of many Europeana providers (Europeana 2015).

All formats include fields for processing analogue and digital cartographic resources at different levels of accuracy and complexity.

Born digital cartographic resources - multitude of dilemmas

The Internet mapping technologies have become ubiquitous enough that anyone can create a digital map or an atlas. As such, many governmental and nongovernmental agencies, private companies and interest groups or organizations have accepted this practice. A variety of such born digital cartographic materials, with different levels of (multimedia) interactivity, have created a multitude of dilemmas for map librarians. Two key issues are: 1) collection development issues and the ability to keep track of born digital maps and atlases, primarily through the process of cataloguing and 2) archiving and preservation of digital cartographic items published in a variety of formats.

Because a large portion of digital maps and atlases are published outside the traditional publication process and because they are created without widespread notification, they are difficult to include in most collection development activities and they risk becoming "lost".

Keeping track of digital cartographic items can occur in a number of different ways depending on the collection development and cataloguing policies at individual institutions. Libraries can choose to catalogue web pages, PDFs, or other formats directly to their online catalogue; use commercial, fee based products such as LibGuides as a collection/collecting resource; or use commercial, free products such as Pinterest or Pocket (Nolan et al. 2014).

Special map libraries, university and research libraries with the main purpose to service educational and research processes felt these issues more dramatically, and have to react faster and more efficiently.

Archiving and preservation of born digital cartographic items have been particularly challenging as there is no standard format. Thus, any entity responsible for archiving these materials, need to be

prepared to implement a variety of technologies to support the storage and preservation of digital maps or atlases to ensure access for future generations and for the preservation of the data they contain (Nolan et al. 2014).

National libraries as heritage institutions are subjects of the Legal Deposit Law. It has been progressively extended to all types of materials of expression and creation, including new technologies, and covers also born digital cartographic materials, but not in all forms. In many national libraries born digital maps and atlases are maintained and handled by Digital library or Digital archive units, no longer by Map Collections. Very often the access to national cartographic production in digital form remains in the domain of national surveys agencies, as a result of the lack of technical equipment, storage capacity of such large-scale data and funding in the libraries.

We could conclude that the questions concerning the maintenance of born digital cartographic materials (what should be collected?, how it should be processed?, who is responsible for the archiving?, how to provide continued access?) remain unanswered in many segments.

Conclusion

The main task of map libraries is to make cartographic heritage (in all forms) expressive and useful in the digital environment for the world of today and tomorrow as well. To achieve this goal, efforts range from implementation of new services and techniques, through the transformation of traditional catalogues and cataloguing processes, to the development of new guidelines for born digital heritage for the future. All efforts originate from the very essence of cartographic heritage and all its attributes.

Map librarians have always deeply identified themselves with the nature of the cartographic material - more than other librarians and archivists. In 1999, Jan Smits, a long-time secretary and president of LIBER GdC, stressed in his article entitled “The necessity and nuisance of survival, or how to keep our senses”, that »there are developments, which show that societies, which occupy themselves with spatial data become overlapping or are looking into the possibilities of federating«.

Fifteen years after the publication of this article, MAGIC, a new association of map and geoinformation curators was established. It joined the ICA Commission on Digital Technologies on Cartographic Heritage, the entity resulting from the world authoritative body for discipline dealing with the conception, production, dissemination and study of maps. The Commission emphasizes the digital approach to cartographic heritage as a meeting area of modern cartography digital mainstream and of history of cartography, maps and mapmaking, and as a bridge connecting the cartographic and mapping past with its present and future (Livieratos 2012). Close collaboration of map curators with ICA Commission seems to be a natural step in searching an exchange space for best practices and ideas, to support each other in common approaches and, to develop vibrant networks. With this step, the map curators got closer to the very nature of their resources – cartographic heritage. Maybe they were the first in the library profession to announce new options of connections in various disciplines in the digital age, and a changing of the concept and structure of the libraries themselves.

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