Policies for Geospatial Collections:
a Research in US and Canadian Academic Libraries

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Abstract

Geographic information is essential to economical and political implications. The technological development of recent years and the simplicity of many applications have made it part of everyday life of citizens.

It is common to libraries, especially those who serve departments interested in geographic content to organize such collections and provide services to their users.

The rapid diffusion of free data in the internet and the growth of open access software have begun to affect libraries in adopting policies related to the collections and services of GIS.

The work presented in this paper seeks, through the investigation of geospatial collection development policies' of 21 academic libraries in United States and Canada to identify those characteristics reflecting their adaptation to the new era of open data.

Key Words: Geospatial collections, collection development policies, academic libraries, open data, surveys

1. Introduction

The geographic information constitutes an important type of information connected to the daily activities of all citizens and to issues related to the broader environment in which they live and develop as well. The potential offered now by the digital publishing and communication environment have contributed to the rapid diffusion of digital geographic information through the internet via different channels and output in different forms. The term "geographic information" may until recently have been connected to the meaning and use of printed maps, the spatial diffusion datasets, demographic data, remote sensing images, orthophotos, etc., ie information relating to a site, has led to the use of the term "spatial data" while the original term "geographic information" performs better issues related to features that describe the earth's surface. Both terms are used in the international bibliography and are closely connected to the technology of GIS.

It is commonly accepted that libraries are typical agencies that organize, manage and disseminate knowledge, therefore their involvement with the printed geographical information is not a new discovery. However in recent years, the various economic and social conditions and adaptation to the growing needs of their users in conjunction with geographic information continuous flow on the Internet, led to the development of new collections and services to their patrons. Consequence of technological evolution constitutes the rapid development of GIS applications and their users, while increasing the demand for geospatial data and the transfer over the Internet [7]. Computing technologies, such as sensor computing, cloud computing, mobile computing, visual computing, business intelligence, spatial database server, and high-performance computing, play key roles in geospatial technologies and applications[1].

Geospatial Collection Development Policies refer to all the necessary procedures adopted and recorded by a library in order to develop print and digital geospatial collections capable of meeting their user's information needs.

Although several studies have been performed for GIS in libraries, though there is a gap on researches about policies related to the development of geographical collections and this paper attempts to contribute towards this direction.

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[1] The importance of the above are clearly underlined by US Government which recently announced a 'Big Data' research and development initiative in response to processing the large amount of data collected by geospatial and other systems. Under this initiative, several federal government agencies, NSF, USGS, DARPA, DOD, NIH, and DOE, commitment for the programs total $200 million. Big data refers to the rising flood of digital data from many sources, including the sensors, digitizers, scanners, software-based modelling, mobile phones, internet, videos, e-mails, and social network communications. The data type could be texts, geometries, images, videos, sounds, or their combination. Many of such data are directly or indirectly related to geospatial information. The emerging opportunity arises from combining these diverse data sources with greatly improving computing tools and techniques needed to access, organize, analyze, visualize, and extract useful information from huge diverse data sets [http://www.com-geo.org/conferences/2012/topics.htm]

2. Policies and Libraries

According to IFLA Guidelines for a collection development policy "the main reasons for having a written collection development policy can be put under four broad headings: 1.selection 2.planning 3.public relations 4.the wider context".

Collection development policy statement is a necessary tool for a librarian used to "describe an individual library's objectives in developing its collections" [4], and as [28] argues "is no longer just about creating the physical collection but more important is the notion of providing access to information regardless of format or location".

In the world of digital libraries, a policy is typically described as a condition, term or regulation governing the operation of a digital library or some aspect thereof. People (such as digital library staff members, managers, and stakeholders) make policies for digital libraries. Sometimes, these policies can be expressed as rules. Rules provide mechanisms to express complex policies in ways that computer systems can interpret and apply them. At a user's level, digital library access policies must be enforced, and users often need to "be informed of the policies and educated as to what constitutes a reasonable behaviour" normally through usage policies. At a repository or at a collection level, formalized policies can be followed through trusted systems or through secure combiner (encryption, digital signatures, and public-key encryption). [19].

In the "Framework of Guidance for Building Good Digital collections" that Institute of Museum and Library Services (IMLS) Digital Library Forum [2] created the *Framework Collection Principle 1* recommends that digital collections be *"created according to an explicit collection development policy that has been agreed upon and documented before digitization begins.*" As in the same paper appears "there is confusion between collection development policy and digitization selection guidelines, which though closely related are not synonymous" and authors based this argue in "the lack of substantial pre-existing collection development policies hint at problems engendered by the opportunistic way that digitization and digital collection creation is undertaken".

As geospatial data by nature are unique and complicated and dependent upon software and hardware for access and analysis an essential step in creating and integrating GIS services and collections in an academic library is in creating a sound collection development policy. A number of factors as user needs, available budget, technological infrastructure and staff development programs, are important factors in constructing a policy [1]. A policy can be understood as political, management, financial, and administrative mechanisms structured to ensure the delivery of certain consistent outcomes or behaviours.

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[2] In the spring of 2001, the Institute of Museum and Library Services (IMLS) convened a Digital Library Forum to discuss the implementation and management of networked digital libraries (DLs), including issues surrounding DL infrastructure, metadata, the use of thesauri and other forms of authorities for controlled terminologies, and the use of automated processes for content enrichment, e.g., to better support inclusion of digital resources in curriculum materials and teacher guides.

3. Bibliographic review

In the international bibliography, literature relating to policies concerning geographical/geospatial information can be classified in 2 types: 1) those related to researches on the implementation of GIS in libraries referring policies aspects in their content and 2) those articles that were written specifically for policies.

In the above context and in the *first type* of articles the majority of them appeared after 1992, which was the year that ARL GIS Literacy project implemented in libraries. [2] points out the CDPs because "the management of and efficient access to it [spatial data] is one of the key challenges that librarians face as GIS service providers" while [24] states that "in an academic library in institution with active GIS initiatives need to identify and establish contact with faculty to determine teaching and research needs". [3] argues that "developing collections of GIS-related materials and spatial information in support of teaching, research, and public access is an important first step in initiating a GIS service policy and in assisting library staff to become GIS literate". [5] conducted a survey for member libraries (123) and as revealed of it the demand for geospatial data seem to be growing and participants' comments that are revising collection development policies so to address this need.

[13] in his paper for GIS collection development in Harvard University argues that "GIS collection development does not always coincide with the organization's traditional collection policy" and names how should a librarian act so to formulate a successful CDP. [25] after examined 69 academic libraries' websites concluded that "regularly assessing and revising policies helps academic library adapt GIS services to strike a balance between ever-changing needs of users and finite library staff, equipment and budgetary resources". For the best accomplishment of National Geospatial Digital Archive project[3], University of Santa Barbara at California and Stanford University which are partners in it, created three CDP because "in the long term this strategy will support more breadth to the archive as well as leverage the strengths of each institutions" [12].

In the *second type* of articles, [31] outlines CDP that can be applied to many types of information agencies especially as a step toward the identification and standardisation of effective practices in which were based on in Mann Library at Cornell University. [9-10] in his several works regarding policies for geospatial collections emphasizes their necessity through the focus on the key areas of interest to the geospatial community which indicates as pricing, copyright, security, privacy, licensing, and access and use. In the same philosophy lies [27] when describes the development of a data management policy for the Cornell University Geospatial Information Repository (CUGIR) while she illustrates that "in developing a policy, data distributors are advised to consider such issues as intellectual property rights, liability issues, distribution methods and services, data and metadata management practices, security risks posed by geospatial data, and user limitations".

The bibliography related to the involvement of libraries in developing geographical collections over the last years is significantly increasing [34] as the aforementioned articles indicate. Nevertheless, the content of policies related to geographical collections needs further exploration.

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[3] The project funded by the Library of Congress and the goal of the collaboration was to collect, preserve, and provide long-term access to at-risk geospatial data http://www.ngda.org/

4. Research Questions

Academic libraries that already own or want to develop geographical collections, have to deal with the phenomenon of the rapid diffusion of open geographical data on the web while must offer their users additional services in order to cover the continuously increasing demands in times of low budget. Our research question relates to whether or not reflected in the policies adopted by each library to develop its geographical collections, the move towards open data. Furthermore, a research in the content of written policies will clarify what are finally the issues that a library consider as important to include in its regulations and communicate to patrons through its website.

The research questions formed in this context are:

1) What are the main features of geospatial collection development policies?
2) Do geospatial collection development policies include features that reflect the adjustment of libraries to the rapid growth of open geospatial data?
3) Do the existence geospatial collection policies reflect the adjustment of libraries to limited financial means the last few years?

The aforementioned research question comes also to explore the conclusions of an [5] where participants in their comments *"indicate that they expect growth in the demand for digital spatial data and are revising collection development policies to address this need"*. Our research involves libraries that are members of ARL and initial members of ARL GIS Literacy Project (8 from US, 7 from Canada), however, it does not focus in libraries that meet this requirement.

5. Methodology

The specific work expands our previous researches which were mainly quantitative and aimed to identify the existence of geospatial collections in academic libraries and geospatial collection development policies as well [29-30]. More specifically relied on the survey we undertook from May to August 2011 and in which we searched websites of a stratified sample of academic libraries in US and Canadian Universities which inter alia operate those departments whose curricula are based on the use of geospatial information and GIS e.g. Geography, Geology, Topography, Earth sciences, Environmental sciences etc. in other words to serve departments where GIS systems are necessary for education and research. To identify those academic libraries we used Libwebcats[4], a directory of libraries throughout the world, and in addition the Libweb[5] a directory of library home page. Among the examined policies are those of major universities that were pioneers in developing geographical collections and establishing GIS services (e.g. University of California – Santa Barbara).

This method of analysis of web content and data collection using the combination of browsing and searching is similar to the coding technique described by [16], who proclaim that *"a library's web site can provide a powerful forum for communicating with users"*. The aforementioned researchers used this technique to analyze the use of

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[4] http://www.librarytechnology.org/libwebcats/
[5] http://www.indiana.edu/~librcsd/internet/libweb-mirror/

library web pages to communicate specific information to faculty, while [8] used it to search the use of library web pages to promote data resources to all researchers. [33] used the same methodology, in part, to "*understand to what extent academic libraries are participating in GIS Day events on their campuses, as well as to what extent those events are being promoted and described on the library's web pages and through the dedicated web site gisday.com*".

We considered content analysis method as the proper one for the specific research since our purpose was to investigate the policy texts, therefore we had to deal with specific words which they represent specific activities (e.g. acquisition) or issues (e.g. purpose) of libraries which in the bottom line harmonize their operations in a specific way easily understandable by its users.

What differentiates our research from those mentioned above is the focus on policies regarding geographical collections nowadays that libraries facing financial problems and the technological potential can be used as a means of continuous provision of services and collections.

6. Data Collection

We focused our research on policies provided by 21 libraries (13 in US and 8 in Canada).

More specifically our research was held through the following steps:

1) At first we recorded the number of libraries that have policies. This was the result of browsing the initial sample of 331 libraries' websites for: a) the library's "GIS collection/data", "GIS services", or "geospatial collection/data", or "geographical collections/data" webpage if existed, b) for relevant terms "geospatial policies", "collection development policies". If there was no result when using those terms, we searched the library's home page and tried to locate the link "policies" or "collection policies".

2) Our next step was to download all the policies we found.

3) Step three was to make an Excel spread sheet where the basic elements were the libraries' names.

4) Each policy was read carefully and it appears that each of those texts comprises of certain specific categories of information (Fig.1) and each category includes several topics. The lists of words based on the top words of topics indicative of policies were used as *features*.

5) In step five, those specific categories (which also form the features we seek to measure) mentioned by each of the policies, were grouped together so as to isolate what was common to all and highlight those referred to specific cases. Thus, we grouped results in 5 basic broader categories.

6) As each policy text is a mixture proportion of categories and topics and each topic corresponds to a specific category of information, it was in step 6 that we assigned topics to categories, depending on the library's will to give detail or brief information related to one category or topic than the others. Similarly, the layout of position of each category of information varies, depending on library's decision.

7) After this, we recorded the number of topics related to the broader ones and ranked them by frequency of appearance in policies.

8) Finally, we constructed Tables which contain each Feature and related Topics.

Fig.1: Categories and Topics in policies' text

7. Results

Our study focused on 21 academic libraries (13 in U.S. and 8 in Canada as shown in Fig.2) which had geographical collections development policies as shown by prior research [29-30].

Fig.2: Examined academic Libraries of US and Canada

As we mentioned above, results were grouped and organized in Tables. Thus, answering our **first** research question which concerns the *main features of geospatial collection development policies*, our survey revealed that these are:
1) "General information"(Table 1)
2) Information regarding "Collection" (Table 2)
3) Information regarding "Data" (Table 3)
4) Information regarding "Open Access" (Table 4)
5) Information regarding "Cooperation"(Table 5)

Analyzing each one of the characteristics above that the majority of academic libraries provided on their website for informing their users, we can identify that in the first feature *"General Information"* we can distinguish the following subset of topics presented below, [6] classified according to the extent of their appearance in the policies' text: 1) Date created/revised/updated[7] (14), 2) Person related to/responsible for the collection development policy (11), 3) Department Description/Academic Program Support (5) 4) Special considerations for collection development (1) 4) History (1) 5) Location of GIS Collection (1). As Table 1 illustrates the occurrence of *Date created*/revised/updated/ and *Person related to /responsible for collection development policy* are in high percentages while *Special considerations for Collection Development*, *History* and *Location of GIS* remain slightly less prevalent than *Department Description*.

Rank	Topic	No of policies	Percent (n=21)
Table 1. General Information			
1	Date created/revised/updated/	14	66.6%
2	Person related to/responsible for collection development policy	11	52.4%
3	Department Description/Academic Program Support	5	24%
4	Special considerations for collection development	1	4.8%
4	History	1	4.8%
4	Location of GIS Collection	1	4.8%

In Information regarding *"Collection"* (Table 2) are several topics relating to the collections. These are: 1) *Collection Purpose/Purpose of the collection/General Collection principles* (10), 2) *Collection Guidelines* (10) 3) *Selection/Evaluation & Prioritization* (4) 4) *Audience/Description of users/*Distribution (4) 5) Collection Profile/Description/Level/Brief Overview (4) 6) Acquisition/s (2) 6) *Price* (1).

It is worth analyze the subset "Collection Guideline" since in most academic libraries consists a main part of policies which is divided in other topics as : *Subject boundaries/priorities* (11), *Publication dates collected* (9), *Languages* (9), *Geographical range* (8), *File formats and types* (8), *Type of materials included and excluded* (5), *Chronological span/limits* (4).

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[6] Results are presenting in numerical order as ranking shown in Tables. The number in parentheses indicates the number of policies on which this term detected.

[7] We consider appropriate to point out all the names under which the particular category was recorded.

	Table 2. Collection		
Rank	**Topic**	**No of policies**	**Percent (n=21)**
1	Collection Purpose/Purpose of the collection/General Collection principles	10	47.6%
1	Collection Guidelines:	10	47.6%
	Subject boundaries/priorities	11	52.4%
	Publication dates collected	9	42.9%
	Languages	9	42.9%
	Geographical range	8	38.1%
	File formats and types	8	38.1%
	Type of materials included and excluded	5	23.8%
	Chronological span/limits	4	19.04%
2	Selection/Evaluation & Prioritazation	4	19.04%
2	Audience/Description of users/Distribution	4	19.04%
2	Collection Profile/Description/Level/Brief Overview	4	19.04%
3	Acquisition/s	2	9.5%
4	Price	1	4.5%

Information regarding the feature "Data" as shown in Table 3 gathers the following topics: 1) *Use/Licensing/Restrictions/Copyright* (4), 2) *Data* (3) 3) *Weeding* (3) 4) *Metadata* (2) 5) *Documentation* (2) 6) *Software support* (2) 7) *Citation* (1)

	Table 3. Data		
Rank	**Topic**	**No of policies**	**Percent (n=21)**
1	Use/Licensing/Restrictions/Copyright	4	19.04%
2	Data	3	14.3%
2	Weeding	3	14.3%
3	Metadata	2	9.5%
3	Documentation	2	9.5%
3	Software support	2	9.5%
4	Citation	1	4.8%

Availability of "Open Access" is shown in Table 4 and is expressed through 1) *Governmental sources* (e.g. US Sensus Bureau, municipal agencies) (10) 2) *Depository programs* (e.g. FDLP, USGS, Canadian Topographic maps & data) (8) 3) *Commercial firms* (8) 4) *Free data* (3) 5) *Gifts* (3) 5) *Consortia arrangements* (2) 6) *Non-profit entities* (e.g. professional organizations or environmentally focused non profits) 7) *Products issued by people* (1)

Table 4. OPEN ACCESS (availability of data)			
Rank	**Topic**	**No of policies**	**Percent (n=21)**
1	Governmental sources (e.g. US Sensus Bureau, municipal agencies)	10	47.6%
2	Depository programs (e.g. FDLP, USGS, Canadian Topographic maps & data)	8	38.1%
2	Commercial firms	8	38.1%
3	Free data	3	14.3%
3	Gifts	3	14.3%
4	Consortia arrangements	2	9.5%
5	Non-profit entities (e.g. professional organizations or environmentally focused non profits)	1	4.8%
5	Products issued by people	1	4.8%

"Cooperation" details in policies are addressing according Table 5 with 1) *Cooperative arrangements and related collections* (7) and 2) *Interdisciplinary Relationships* (2).

Table 5. COOPERATION			
Rank	**Topic**	**No of policies**	**Percent (n=21)**
1	Cooperative arrangements and related collections	7	33.3%
2	Interdisciplinary Relationships	2	9.5%

According to the findings that answer the second research question of the investigation, the features *that reflect the adjustment to the rapid growth of open geospatial data* could be considered as Governmental sources (e.g. US Sensus Bureau, municipal agencies) and Depository programs (e.g. FDLP, USGS, Canadian Topographic maps & data) as shown in Table 4, since they appear 10 and 8 times accordingly in library's policies. On the contrary, Non Profit Organizations or Products issued by people are not familiar in academic libraries, since only 1 library mentions them as a source of data while Free Data and Gifts is used by 3 libraries, and Consortia Arrangements by 2 libraries.

"Open Access" and *"Cooperation"* could be considered as features that reflect the adjustment to limited financial means, and which answer to our third research question, as shown in Table 4 and Table 5 of our results.

8. Discussion

The present study aimed to highlight the policies' characteristics of geospatial collections as they are displayed on the web pages of academic libraries.

This examination of academic libraries web pages has shown that many libraries have chosen to make available collection development information through the internet. Of the web sites examined 21 had some type of collection management statement that ranged from a thoughtful detailed policy to a single sentence mission statement. This left a large number of libraries with no collection information that could be found in their web pages.

The approach that libraries chooses to develop geospatial data determines in a way how policies will be communicated since according to the analysis of our findings 6/21 policies were only for GIS collections, 5/21 along with map collection and 8/21 along with geographical collection.

It is worth mentioning the heterogeneity of policies texts we studied for completing this research. They did not follow a specific formula since in some libraries are analyzed and recorded in detail and are multi paged while in some other documents provided, contain epigrammatic information regarding important issues like acquisition or data distribution (e.g. Emory University Library).

The difference in used terminology is one of the policy's attributes highlighted through this work. This difference in terminology can easily be explained since each library formulates its own policies in accordance with its own priorities and potentials and there is not any guideline text from e.g. an Association that libraries could rely on for developing their own documented policies. As we noticed through this study, there are libraries which could be considered as pioneers in geospatial data collections and have developed well formed texts which could easily be used as a guideline.

The collection development statements we studied relies their usefulness mainly on information about the data and their format as well as the way that a user can have access to it. Other information similar to those given for the non geospatial material is also provided e.g. who has the right to access the information.

Despite the fact that some libraries have developed portals of freely available data that librarians detected on the internet, in the policies' text open geospatial data are mentioned by the minority of libraries only in order to costs and budgets in conjunction with the types of data and their scales. Another point worth to be highlighted is the fact that a number of libraries are developing geospatial collections taken into account are the collections of other libraries nearby (e.g. University of Pennsylvania, University of Chicago). An absolute increase in emphasis on collaborative approaches to collection development can be detected through these movements and all these trends derive from a need to reduce the financial costs.

Although Free Data and Gifts are considered to be for library professionals common practice for data supply, however in geospatial data as we can identify this does not happen regularly since only 3 libraries refer those two ways of having data

The lack of GCDPs from countries outside America may mislead the potential researcher since US and Canada has lots in common in applying library science. Without any input from participants in library environment (users and librarians) this research is limited to what can be seen and inferred from the written policies. While the sample includes libraries that have published their policies in the World Wide Web, we cannot ignore those ones that although they have written policies nevertheless for some reasons have chosen not to upload them on their website.

Therefore the focus on internet published policies will not allow any comparison with internal written documents that may or not exist at the rest libraries with GIS. Given these limitations, any general statement will be clearly limited.

9. Conclusions

It is clear that separate collection management pages are the preferred vehicles for presenting information about the collections [16]. The present research reported that the main features of GCDPs are information regarding: General Information, Collection, Data, Open Access, and Cooperation. The topics that in the majority of collection management policies for geospatial collections appears: Person related to/responsible for collection development policy (52.4%), Collection Purpose (47.6%), Collection Guidelines (47.6%), Subject boundaries/priorities (52.4%), Governmental sources (e.g. US Sensus Bureau, municipal agencies) (47.6%), Use/Licensing/ Restrictions/Copyright (19.04%), Cooperative arrangements and related collections (33.3%).

10. Future Work

These five features aforementioned are those we revealed from our research in US and Canadian academic libraries. It would be interesting to further explore the written policies of academic libraries in other countries of the world e.g. Europe, where also have developed geographical collections. Recent development in managing geospatial data (e.g. linked data) along with the adoption of new strategic actions (e.g. co operations) are potentials that libraries should exploit. Therefore, we consider that policies related to geospatial data have not been adequately examined.

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Appendix 1: Examined Academic Libraries List

LIBRARY NAME	GEOGRAPHICAL/GEOSPATIAL COLLECTION DEVELOPMENT POLICIES URLs
Carleton University Library	http://www.library.carleton.ca/about/policies/collection-development-gis-resources
Cornell University	http://cugir.mannlib.cornell.edu/CUGIRCollectionDevtPolicy_20060825.pdf
Duke University	http://library.duke.edu/research/subject/guides/maps/map_policy.html
George Washington University	http://www.gelman.gwu.edu/collections/policies/maps-and-gis.pdf/view
Iowa State University Library	http://www.lib.iastate.edu/cfora/pdf/3000057.pdf
McMaster University	http://library.mcmaster.ca/collections-services/policies/lloyd-reeds-map-collection
Queen's University	http://library.queensu.ca/research/collections/maps-geospatial-data-and-air-photos#geograph
Ryerson University	http://www.ryerson.ca/library/info/collections/colldev/material.html
Simon Fraser University	http://www.lib.sfu.ca/collections/collections-policies/geography
Stanford University / GIS at Branner	http://lib.stanford.edu/gis/
University of California-San Diego	http://libraries.ucsd.edu/_files/sshl/pdf/Geospatial-Data-Collection-Plan.pdf
University of California-Santa Barbara	http://www.library.ucsb.edu/services/policies/collections/geogcdp1.html
University of Chicago	http://guides.lib.uchicago.edu/content.php?pid=115216&sid=1220061
University of Colorado at Boulder	http://ucblibraries.colorado.edu/collectiondevelopment/geography.htm
University of Illinois Urbana-Champaign	http://www.library.illinois.edu/gex/classes/collectiondevelopmentgeosciences.html
University of Manitoba	http://www.umanitoba.ca/libraries/units/datalib/gis/gis.html
University of New Brunswick	http://www.lib.unb.ca/about/policies/colldev-UNBF.php#II
University of Pennsylvania	http://www.library.upenn.edu/collections/policies/maps.html
University of Waterloo	http://www.lib.uwaterloo.ca/staff/irmc/collectionsmanagement.html
University of Wisconsin-Madison	http://www.geography.wisc.edu/maplib/Docs/GISData_Dist_Policy.pdf
University of Wisconsin-Milwaukee	http://www4.uwm.edu/libraries/CollPolicy/u-agsl.cfm