Ifigenia Vardakosta[*, **], Sarantos Kapidakis[*]

Suggestions for developing geospatial collections in Greek Academic Libraries

Summary: The emergence of technology today favours both the creation and the publication of large volumes of information, of which the geospatial information constitutes a noteworthy part. Lots of libraries worldwide develop geographical collections and provide related services to their patrons; Greek libraries have not taken similar actions so far.
This paper presents some proposals for geospatial collection development in Greece which are based on the results of a three-phase-research that the authors conducted. More specifically, the three-phase-research aimed to collect data for the current context of geospatial information in Greek libraries. Therefore, it was addressed to libraries, GIS experts as a focus group and GIS users in order to record their point of view, as well. The research was conducted from February 2010 to April 2013 and a variety of research tools were used (interview with questionnaire, website investigation, content analysis and an electronic questionnaire). The participants of the research answered different sub areas like the "library use", the "necessity of a geospatial collection" or the "open access". Using participants' answers in the above sections and after we enhanced their suggestions in the open ended question, we formulate proposals towards geospatial collection development.
Geospatial collections constitute a new research field for the Greek librarian community which has not yet been adequately investigated. While many surveys aim at measuring general user satisfaction, this paper is based on the first Greek research for GIS users and their needs. Therefore, we argue that this written plan could be utilized in two ways: a) as a guide for those libraries that want to develop geospatial collections and b) as the key point for a broader discussion among librarians towards the adoption of substantial changes in order to manage innovative collections and services for covering the growing needs and demands of their users.

Introduction

Internet and computerized cartography set new standards and the formation of geographical information systems (GIS) adds a totally new dimension to spatial information. Spatial data, i.e. information with geographical reference, has become important in almost every area of modern life and economy. GIS is the magic acronym that enables us to display countless statistical and numerical data through our computers, describing complex situations and processes on earth in a visual way. An important part of this visualization is the digital or electronic map (Buhler 1999). As Phadke (2006:12) states in his work "*GIS has influenced the field of library and information science in three ways: a) in the availability of voluminous information on GIS, the task before the librarians now is to handle this vast amount of information b) due to the variety of applications of GIS in different fields, users of geographic information are putting pressure on the library as the central place for information on GIS, information services based on spatially referenced data and*

[*] Laboratory on Digital Libraries and Electronic Publishing, Department of Archives, Library and Museum Sciences, Faculty of Information Science and Informatics, Ionian University, Ioannou Theotoki 72, Corfu 49100, Greece [ifigenia@ionio.gr] [sarantos@ionio.gr]
[**] Harokopio University, Library and Information Centre, El.Venzelou 70,176-71, Kallithea, Athens, Greece, ,tel: +302109549170, fax:+302109560161 [ifigenia@hua.gr]

knowing the use of GIS technology, and c) GIS is impacting on librarianship in using GIS as one of the tools in the library management". Commercial virtual globes (e.g. Google Earth) and global scientific cyber-infrastructures (e.g. Digital Earth) are revolutionizing the way geoinformation is used and produced (Georgiadou et al. 2009).

Geodata is rapidly becoming a conventional and pervasively familiar data type seen at once to underpin and significantly redefine the digital world, with broad implications for both technology and society (Jackson et al. 2009). The data used by geographers and geographic information systems analysts in their operations is diverse and distributed across a wide network of server locations, over a complex series of information nodes. Libraries can provide a unique entry point to this multitude of sources (Abresch et al. 2008). At many universities, the library has served as a central resource allowing students and faculty across academic departments access to GIS resources. Today, as many academic libraries evaluate their spaces and services, GIS and data services are central in discussions on how to further engage with patrons and meet increasingly diverse researcher needs. (Scaramozzino et al. 2014).

Developing geospatial collections is a rather common practice in libraries, even among those that do not serve an academic department (e.g New York Library). What is more, their development is seen also as modernization of the maps´ collection, which, however, remains unknown territory in Greek academic libraries. In Greece, the academic libraries, despite their vast development achieved in the last twenty years, mainly due to the funding by the European Union, have not turned their focus upon the development of geospatial collections of services. There have been only a few that have occupied themselves with this matter, underlying the interest of their users; nevertheless they have not reached a satisfying level of development, equivalent to that of the libraries abroad (e.g. Branner Earth Sciences Library & Map Collections, Cornell University Library). The purpose of this study is to raise awareness about geospatial collections among library professionals in Greece and abroad as well, by suggesting a series of actions/initiatives that should be followed by a library which has decided to include the geospatial information in the range of its services offered to its public. Firstly, this essay makes a reference about the existing situation of geospatial collections all around the world, while at the same time describing the today's situation of public geospatial data in Greece. The purpose of the literature review that follows is to show other relevant researches that have been fulfilled on geospatial collections, having as a priority those that aim at recording the users' opinions, like our research had accomplished. The research stages are described in every methodological detail, whilst, the reasons that perceive the libraries from developing their geospatial data and services, are recorded as well.

Furthermore, there is a thorough description of the actions that must be followed by a library, in order for the latter to be able to develop geospatial collections and services, like they were formed after the editing of our research results.

Current environment in geospatial collections worldwide

Technological change accompanied by massive development of computer software industries harnessed hardware developments to improve methods for manipulating information and have created "user-friendly" ways in which the wider community of information users can access information. In short, information has become a tradable commodity and a strategic resource (Longley and Clark 1995: 4). Many items of data collected and used by industry generally have a geographic dimension, and their use can add substantial value to the data (Grimshaw 2000: 53). The point is well made that without data, information is often unavailable to the right people at the

right time and in the right place (Grimshaw 2000: 86). Libraries serve as the catalyst for the collection, management and delivery of geospatial information in support of their users information needs. To maximize the potential of the geospatial data, libraries integrate GIS services for reinforce their community in research and education, since libraries and higher education are inextricably bound together (Branin et al. 2000). Therefore, geospatial collections are considered as the physical reaction of –mainly but not exclusively- the map libraries to utilize new forms of information and modernize their services in order to respond to the new technological environment and to their users' growing needs. Previous research of the authors revealed that geospatial collections are met mainly in academic libraries of the development countries (Vardakosta and Kapidakis 2011).

Sources of data vary, depending on the country concerned. In addition to data availability, copyright, price, and data format are important issues to consider. The choice of data will depend on factors such as the type of application, geographical area required, data formats that can be read by the user's software packages, and the ability to link the spatial data sets to attribute data already held in databases (Grimshaw 2000: 96). Geospatial data can be found in a variety of different types of digital data such as aerial views/, atlases (world/thematic), datasets files/series, city/foreign/thematic maps, remotely sensed images, topographic data, digital map data layers, geologic sections/maps, globes, soil survey reports, world series maps/atlases, aeronautical charts, block diagrams, cadastral plans, elevation models, extraterrestrial maps, gazetteers, hypsographic, etc. The most useable formats for geospatial data are Raster Microforms, ArcInfo coverages, AutoCAD (dwg,dxf), Bentley (dgn) CD-ROM, downloadable programs, ESRI Geodatabase, ESRI shapefiles, GeoJpeg, GeoTiff, and are distributed commonly in CD's and DVD's. Subject categories that libraries choose to offer to their users include both *Physical* (topography, environmental aspects, geology, hydrography, landscapes, natural resource management activities, soil types, agricultural activities, climatology, land use and wildlife data) and *Human Geography* (historical events or periods, political and administrative divisions, socioeconomic patterns, transportation systems, vegetation, ecosystems, biogeography, conservation, biodiversity, regional geography, and energy (Vardakosta and Kapidakis 2013).

Lamont (1997) lists several sources for GIS data, including the US government, state and local governments, researchers on campus, local GIS firms, utility companies, real estate firms, and the Internet.

The variety of service models and the differences among GIS and data programs confirmed by Scaramozzino et al. (2014) in their paper documenting the development, the current implementation and the future directions of data and GIS services at five university libraries.

Authors' previous surveys for Greece concluded that academic libraries have not been activated in the development of geospatial data and services (Vardakosta and Kapidakis 2011). Despite the fact that there are libraries serving departments that geoinformation is crucial for their educational and research needs, they have not proceed to the integration of such collections and services. The few exceptions indicate the recognition of such need and the obligation to cover, even partially, their user's needs. A web service in Greece offering open geospatial data and interactive maps free for all is Geodata.gov.gr[1]. It offers datasets from Ministries, Local Administration, and NGOs

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[1] Geodata.gov.gr was designed and developed by the Institute for the Management of Information Systems, of the "Athena" Research Center (IMIS/"Athena" RC) with no funding from the public sector, and begun its operation in 14/8/2010. In its first months it established Greece as one of the eight countries worldwide offering open geospatial data. Among the first data sets offered were the national administrative boundaries, the census of the Hellenic Statistical Authority, and the boundaries of multiple protected areas.

for a plethora of thematic areas: general urban plans, protected areas, shoreline and beach boundaries, even the public funds subsiding sports clubs across the country, for the past 20 years. Patrons can search for geospatial data, find information regarding their origin, download them, portray them on interactive maps, and freely use and reuse them with no restrictions.

In Greece, the public geospatial data availability does not include any libraries, a fact that may consist the reason (along with the other reasons stated during our research), why libraries are not included in the collection of geospatial data. The growth of GIS collections in U.S.A for instance, can be attributed at the substantial and long standing distribution of materials through the U.S depository program (Larsgaard 1998: 160). However, the library is defined as a dynamic organization that must progress, as well as provide services of added value, in order to fulfill the information needs of its users. Moreover, the library has the responsibility to guide and support their patrons in their diverse and growing information needs.

Law concerns for Geospatial Information in Greece

As Legal Deposit Law for digital materials in several countries of Europe e.g. Norway 1990, Sweden 1993etc (Fleet 2003), established in the decade of '90s, the Greek Parliament in 2010 vote the Law 3882 establishing the National Geospatial Information Infrastructure. This Law came to face two urgent needs of the country: a) establishing all the harmonized practices and rules concerning collection, production, supply, as well as sharing and making available the geospatial data and b) requiring some compliance with the Conduct 2007/2/EK (INSPIRE) that sets a frame of technical interoperability specifications, in order to achieve the automatic distribution of geospatial data concerning the environment (e.g. zones NATURA 2000) among public authorities in National and European level (Nedas et al. 2010). The "National Committee of Geo-information" (NCG), established by the Law 3882/2010 as the supreme political body having decisive, precursory and advisory jurisdictions as well as being given the authority to design and to form the national geo-information politics, along with the guarantee of the whole public domain in a supreme political level, in order to achieve the goals of the law. Because of the dispersion of the geospatial data in the wider Public Administration but also because of the necessity of producing and using these very data by almost every Ministry and their regulated entities, the NCG is designated as an interministerial body answering directly to the Prime Minister. The Law 4305/ 2014 (FEK 237/A') (8.1.15) introduced the "by definition principle of open availability and further use of documents, information and data from the public domain (open by default)". All the above show the State's recognition of the importance of the geospatial data about a large number of everyday human activities that have to do with the environment, the country planning, the energy, the environment, etc.

Literature Review

As library programs evolve to support increasingly technical data and GIS needs, many universities are faced with similar challenges and opportunities (Scaramozzino et al. 2014). Researches carried out for geospatial collections are usually addressed to librarians and aim to detect the extent of GIS implementation and characteristics of libraries that had implemented such services (Gabaldon and Repplinger 2006; Kinikin and Hench 2005; Moore 2005). These surveys emphasize the importance of meeting the users' needs in developing collections and services (Longstreth 1995, Florance 2006). Sweetkind-Singer (2001) in her paper describes two case

studies which illustrate how the library meets patrons' diverse and detailed GIS information and technical needs. Stone Muilenburg (2001) in her research about the current use of GIS in libraries concludes that users have been growing over the last few years and continue to grow as GIS and desktop mapping become more accessible. March (2011) created a survey for better understanding the GIS-related needs of the campus. His survey distributed to faculty, postdoctoral students and graduate students from over thirty academic disciplines on campus. Results of his survey have shown that the library is favored as a central location for offering centralized GIS services and respondents agree that training is needed with mapping-grade GPS technology. The library as the major document gathering source is also indicated by geomatics faculty in Gao et al. (2011) survey by e-mail. Scarletto (2011) recorded reference questions between 2001-2006 and using content analysis method examined subject, geographic area and user-status factors. The purpose of her research was to inform collection development policies and become a benchmark for relating the existing collection to users.

Greek librarian community have investigated users' needs for a variety other than GIS reasons, e.g. usability, information literacy programmes, self-archiving etc (e.g. Avramidou and Vardakosta 2009; Vardakosta e.a. 2013) while Liarou (2015) in her Master Thesis investigated GIS as an innovative implementation in Greek academic libraries. Authors' study in Greek GIS users is the only research that focuses in their needs (Vardakosta and Kapidakis 2014a).

Research Background

Methodology

Proposals presented in this study are the result of a six stages methodology (Fig.1). These stages are the following:

1. Initially we studied the international literature to identify previous studies in the field (Stage1).
2. In Stage2 we conducted an interview/questionnaire addressed to the GIS experts. The aim was to determine how institutions/libraries have implemented GIS focusing on the areas of policies, hardware/software, staffing, costs, monetary support, user education and services evaluation.
3. In Stage3 we proceed to a website research to all Greek academic libraries in order to identify whether academic libraries have developed geospatial collections and GIS services fulfilling their users' informational needs.
4. In Stage4 the aim was to collect GIS user's opinion regarding the current situation in Greek libraries.
5. Results of the above studies (Vardakosta and Kapidakis 2011; Vardakosta and Kapidakis 2014a; Vardakosta and Kapidakis 2014b) were grouped together using content analysis method in Stage5.
6. Finally, the outcome of the above methodology is encorporated in the proposals presented in Stage6.
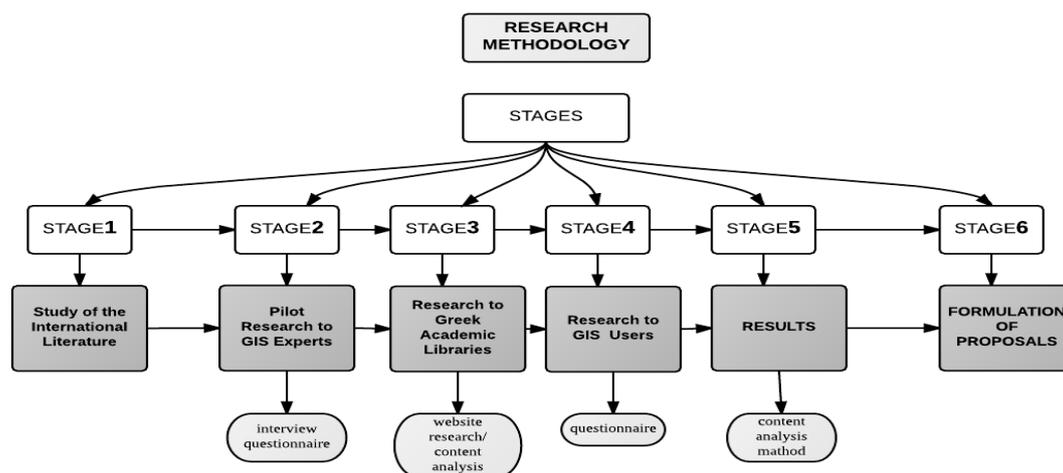
Figure 1. Methodology of the study.

Reasons preventing Greek academic libraries from developing geospatial collections

Results of the above comprehensive research clearly indicated that Greek academic libraries do not fulfill GIS patrons' information needs regarding geospatial data and GIS services. As authors' research concluded:

1. Academic libraries in Greece have not developed efficient co-operations with their institution's departments familiar to the use of GIS (Geography, Geology, etc) which use geospatial information and technology for educational purposes.
2. Geospatial data so far are produced by specific public organizations for their own use or commercial companies.
3. The cost of geospatial data is quite expensive and that is prohibited for the low budgets that libraries sustain especially during the recent years.
4. There were no national or European programs that could fund such an initiative in academic libraries (as it happened in US).
5. GIS services require specific infrastructure, hardware (computers, printers, digitizers, scanners, GPS units, and plotters) and software (commercial or open source).
6. Greek librarians do not seem to be familiar with geospatial data and probably curricula in Librarian's Schools or seminars should be organized as librarians will be the ones who will educate their patrons in the use of the service.
7. So far, academic libraries in Greece do not collect geospatial data that are developed in their institution in order to proceed in organizing metadata, policy issues etc. (Vardakosta and Kapidakis 2011)

Still, the majority of users gave them a confidence vote since they certified libraries as the main organizations for collecting, organizing and distributing geo-information. GIS patrons' point of view clearly indicates the strategic considerations libraries should take into account in order to expand their services and respond to their needs. These strategic considerations were extracted from their answers in the questionnaire (Vardakosta and Kapidakis 2014). According to the research respondents there are a number of reasons that prevent Greek academic libraries from developing geospatial collections. These reasons for GIS users are as follows:

1. *Lack of policies*: The absence of policies is considered as the main reason of preventing the development of a geospatial collection.

2. *Economic issues*: In the era of economic crisis libraries are facing the constant reduced budgets. This fact in accordance with the high costs of acquiring geospatial data and the needed infrastructure forbids libraries of providing such a service.

3. *Lack of administration's interest*: For GIS users the lack of interest shown by the library's administration affects negatively the development of such a collection

4. *Lack of librarian's expertise*: Librarians do not have the appropriate skills and expertise to understand and assist GIS users in their particular needs.

5. *Data issues*: Geospatial data so far are produced by specific public organizations for their own use or commercial companies. Additionally as academic libraries in Greece so far do not collect geospatial data issues regarding metadata, copyright issues, license agreements, etc. have not adequately examined.

6. *Lack of user's interest*: Since the library does not support their geospatial needs, then they will turn elsewhere seeking the information they need.
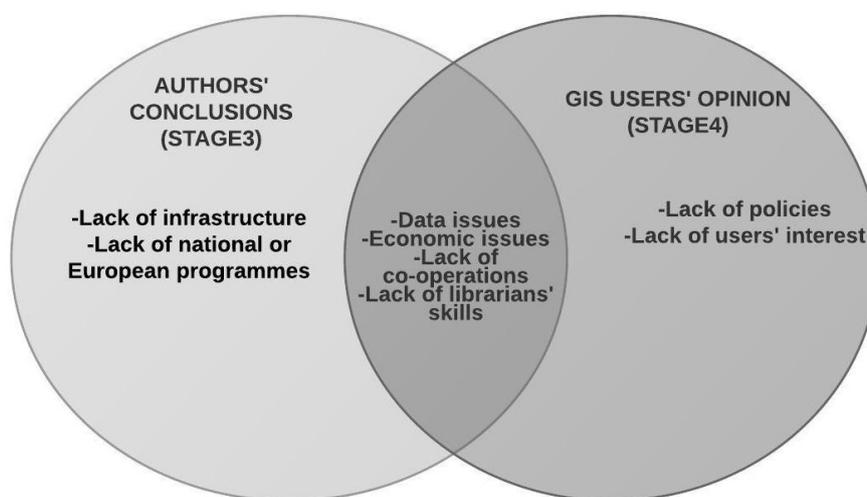

Figure 2. Reasons preventing Greek academic libraries from developing geospatial collections according research results

Developing a Geospatial Collection

Given the fact that academic libraries should cover the geo-information needs of their patrons, a series of actions must be preceded.

The process of change and modernization in the operation of an academic library is extremely time consuming and the development of a geospatial collection requires not only the approval but also the commitment of library's administration.

Taking into account the results of the three-phase-research and mostly what users certified as obstacles in the development of geospatial collections we are attempting a user-centered proposal formulation targeting Greek academic libraries. These proposals are enhanced by the international bibliography and the shift paradigm of libraries abroad. The steps we recommend to an academic library follow and the requirements of the procedure for developing a geospatial collection are:

1) *Detection of user needs*: The library should determine teaching and research needs of its patrons (Longstreth 1995). Building relationships and an ongoing communication with them will be useful in this direction (Abbott and Argentati 1995). The recording and the recognition of their

needs constitutes the first step towards the designing and the development of collections and services, capable to cover them. This can be achieved either by using the method of questionnaires, or by recording questions posed at the library personnel in a certain period of time (Scarletto 2011).

2) *Administration's commitment*: it is necessary for the library to have the administration's agreement- which governs the library- in order to be able to participate in all necessary activities for the collection of geospatial data.

The library will need to define its role on the university community relative to GIS, consequently staffing for the geospatial collection will require an institutional commitment (Longstreth 1995). More than that as Cline and Adler (1995) argue that *"GIS requires an understanding of computing and the ability to work with visual representation of data, in addition to the knowledge and skills typically found in libraries therefore to implement a GIS as a strategic direction for a library requires a commitment".* It should be noted that adding GIS services in an academic library will increase demand on staff resources. This may include providing extra support hours, attending advanced training in GIS theory and methods, hiring student assistants to maintain Web pages and assist with repetitive tasks, and acquiring skills to manage computers with sophisticated programs and large amounts of data. Additional library staff is often required to meet the needs of GIS patrons. A GIS specialist would organize the GIS services, manage the GIS computers and provide technical support, while a GIS librarian would purchase, catalogue and become familiar with the large amounts of GIS-formatted data now being produced. The GIS librarian will need to develop a central collection of GIS-formatted data that reduces the duplication of data acquisition on camp (Sweetkind-Singer 2001).

3) *Policies:* writing a text of policies that will govern the collection is necessary for its smooth operation. This text of policies will include information concerning the following main areas:

➤ General information (information about the collection's development, the domain that serves, the collection's location, the author of the text and the date of the writing).

➤ Specific information about the collection (purpose, topic, cover dates, language, geographical range, material type etc.)

➤ Data information (use, metadata, software needed etc.)

➤ Information concerning the origin of data and the free access,

➤ Information concerning the library cooperation in the domain of geospatial data (Vardakosta and Kapidakis 2012).

The policy texts would have to be approved by the suitable authorities of the organization, they would have to be published in the Library's website as well as to be updated once there are changes in the collection.

4) *Librarians Training:* To work effectively with geospatial data in answering research questions and training new users in the use of resources and applications requires the librarian to understand spatial concepts, tools used to create representations of geospatial data, and cognitive processes using geospatial data (Abresch et al. 2008: 243). GIS is ubiquitous in academic setting (Parihar 2002) and the need in the use of GIS increases across all disciplines, not only to those that they depend on their use (e.g. geology, engineering etc) but also to public health, biology, zoology, human sciences etc) (Abresch et al. 2008: 244). The librarian that relates to the geospatial data has been formed as a new domain in the field of librarianship: GIS Librarian (Shawa 2002). Also, many academic libraries that have developed GIS collections (e.g. University of Texas Arlington[2],

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[2] http://libguides.uta.edu/gis

Princeton University[3], University of North Carolina at Chapel Hill[4]) have turned to hiring a GIS Librarian in order to choose, supply and manage the geographical information and the numerical data, helping, at the same time, the students and the educational personnel to use the GIS technology and supporting the educational and research needs of their academic community (Vardakosta and Kapidakis 2012b). The extent of importance given in U.S. on the role of GIS librarian is reflected in the selection of Julie Sweetkind-Singer Head Librarian in Branner Earth Sciences Library & Map Collections of Stanford University in the National Geospatial Advisory Committee[5]. The enhancement of the geographical abilities required for the geographical information management, could be achieved based on three axes:

1. *The library's own actions*
   - Participation of its personnel in workshops, events, seminars concerning the geographical science and its technologies, in order to be familiarized with the according terminology and the definitions.
   - Collaboration between the Library and the department of the institute that uses geo-information, so as the educational personnel and the students to be guided through the sources and the services that they are interested in.
   - Participation of the personnel in electronic lists, informative brochures as well as in social networks with similar thematic interest.
   - Education of the personnel by non Institutional experts in using the GIS (Todd, 2008).
   - Collaboration between the Library and the website geodata.gov.gr, in order for the personnel to be guided through the use, the development and the spreading of the open data, so as, on their part, to be able to safely guide the user to fulfill his needs.
2. *Librarianship departments in the country*
   - Adding courses in the curriculum[6] that have to do with the technology and the geographical information sources management.
   - Collaboration with the departments of Geography and with others under similar thematic subject, where the use of the geographical and especially of the spatial data is important to achieve its goals, for organizing seminar courses.
   - Pursuit of collaboration with public bodies that produce geographic information, e.g. EKXA, the Ministry of Transport etc., with the purpose of the student's practical exercise.
   - Conducting seminars, workshops etc. by inviting as guests certain librarians that are specialized upon the domain of the GIS Librarian (i.e. experts).
3. *Association of Greek Librarians and Information Scientists*

The object of any library association is to promote the interests of librarians and to enable them to exchange views and to disseminate information among library association members and non-members (Yazdi and Deshpande 2013). The above statement is considered in the top of priorities for the Association of Greek Librarians and Information Scientists[7] as it consist the only scientific

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[3] http://www.princeton.edu/~geolib/gis/

[4] http://www.lib.unc.edu/reference/gis/services.html

[5] http://www.doi.gov/news/pressreleases/interior-department-appoints-17-members-to-national-geospatial-advisory-committee.cfm

[6] The only course included in the study program of the Librarianship department and connected with the geographical science, is "Historical Geography and Cartography", at the 4th semester in the Ionian University. The course is optional and aims at acquiring knowledge concerning the management of the archival materials.

[7] http://www.eebep.gr

Association that represents the librarianship community in Greece. Therefore its contribution in the disposal of geographic knowledge is crucial and can be achieved via:

> ➤ The contribution of organizing scientific meetings and educational seminars for the Greek Librarians.
> ➤ The participation in national educational programs for its members.
> ➤ The collaboration with the Archivists Society of Greek[8] to conduct events for the presentation, the spreading and the editing of the geo-information that derives from the historical maps.

Map Associations in countries in which GIS Librarian is an established title and role for those professionals dealing with geospatial information in a library environment, such as MAGIRT[9], MAGIC[10], British Cartographic Society-Map Curators Group[11], are having a very active role in guiding and bringing together librarians involved in geospatial librarianship.

5) *Data Acquisition*: Focusing on the needs of the user community as a whole, rather than the special purpose or special projects datasets is critical about selecting spatial data along with issues regarding budgets, availability, license restrictions and data formats, staff resources (Longstreth 1995). Since the library has defined the material that interests its patrons (type, topic, etc.) it can proceed on :

> ➤ *Use of public available data:* the library personnel have to guide and support users to extract the information they need from the already available data. Additionally, it may come to negotiations/agreements with public organizations/institutions for being a depository library for their data.

> ➤ *Purchasing data from commercial vendors:* There are commercial vendors that are activated in the GIS market, domestic or abroad and can provide products to various fields such as transport, aerial photos, remote sensing, aerial photos etc. Financial issues and licensing are the key factors that should be carefully examined in this case (Florance 2006).

> ➤ *Investigating and locating free access sources*: as it was mentioned earlier, the collection of the public geospatial data for Greece is published by the geodata.gov.com. For other countries' data that access is perhaps required, librarian should be mainly use electronic guides, online dissemination engines or portals, and related with GIS professionals. Over the past few years GIS professionals and librarians have developed guides to locating geospatial data. Many academic institutions have created virtual collections of web links to frequently used sources of geographic information such as Stanford University Libraries, Harvard College Libraries, University of Arizona (Florance 2006). Since over the past years the academic research is based on data of free access, their localization and their public availability is extremely essential (van Loenen and Onsrud 2004).

> ➤ *Locally produced data:* The geospatial data are produced even from the very same universities during the performance of educational and research activities (e.g. field activities, in the frame of doctoral thesis etc.). These data, can be gathered in the library and be spread via the institutional depository of the faculty, so as for them to be re-used for educational and searching purposes, both inside the academic society, but also available to a wide public through open access. The fulfillment of this suggestion, i.e. the collection of the geospatial data produced by this very organization inside which the library functions, requires:

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[8] http://www.eae.org.gr Archivists Society of Greek
[9] http://www.ala.org/magirt/front
[10] http://xeee.web.auth.gr/ICA-Heritage/MAGIC/
[11] http://www.cartography.org.uk/default.asp?contentID=702

- The policy, checked and certified by the authorized institutional members, which will be connected with the obligation of the part of the academic society members to state the data that they produce during the exercise of their duties.
- The appropriate mechanism of collecting data (e.g. in cds) or self deposit.
- The appropriate tools being chosen to be used for editing and managing data (metadata, type of the file, thematic indexing etc.)
- The detailed instructions of usage to be developed, so that they can be used by anyone to trace information.
- Finally, the library should provide so as the depository to be accessible by search engines, in order for the data that are gathered in it, to be successfully reclaimed.

It must be stated that, in the realization of all the above, the library should check matters related to copyright issues, licenses and creative commons and it should also inform all the potential depositors about them.

6) *Use of tools for managing geospatial data*: Geographic information is available on a variety of media. Identifying the appropriate information currently requires separate enquiries to separate metadata systems (Antonelli 1999). Metadata enable users to understand what the data are, how they are collected, when they are processed, and their format, currency and scope (Longstreth 1995; Florance 2006). Geospatial metadata commonly document geographic digital data such as GIS files, geospatial databases, and earth imagery but can also be used to document geospatial resources including data catalogues, mapping applications, data models and related websites. Metadata records include core library catalogue elements such as Title, Abstract, and Publication Data; geographic elements such as Geographic Extent and Projection Information; and database elements such as Attribute Label Definitions and Attribute Domain Values (http://www.fgdc.gov/metadata). In the desire to adequately and accurately describe geospatial resources, cataloging codes and practices have been established to accommodate these new resources, to provide networked access to these resources and to respond more effectively to an increasingly broad range of user expectations and information needs (Hanson and Heron 2008: 82). MARC XML, AACR2, RDA, FRBR, classification schedules, subject access, and lately linked data are issues that should be explored by the library, defined and used in standardized basis so to ensure consistency for access and retrieval.

7) *Technological Infrastructure:* Acquiring the geospatial data from the library is strongly connected to the availability of the technological infrastructure both for their use and for their public availability through services formed by the library. The technological infrastructure can include, except for the hardware and the software, components extremely necessary for the data use, but also a series of other equipment (scanner, plotter, digitizer, tape drive etc.) which will allow patrons to efficiently utilize the provided data and access them remotely. Only then is the investment worthwhile and fruitful, and the system efficient in meeting its purpose (Phadke 2006: 4). The use of free access software will contribute in reducing the costs.

8) *Open access*: over the past few years the open access movement gains more and more ground in the geospatial data field. We mentioned earlier that Greece, through its legislation system, has facilitated the spreading of public data as well as the reclamation of these data through open access. Open access in a Library environment can be applied in two ways:

a) both by providing data, since this kind of policy has been adopted by the overall organization to which the Library belongs, and

b) also by collecting and spreading data that are under the state of open access.

9) *Cooperations:* building cooperations constitutes an essential component for the success of the Library's initiative concerning the development of the geospatial collection. Argentati (1997) in the early GIS bibliography stated that one strong partnership often leads to others and to additional contacts with people and organizations engaged or interested in GIS. The types of collaboration that could be created by the Greek libraries are the following:

➢ With the department of the common organization of the Library, for the collection and services development. This practice is being followed by many libraries abroad, e.g. McGill University, Dalhousie University, Brock University (Adler and Larsgaard 2000: 4; Mcfarlane and Rodgers 2008).

➢ With other Libraries that keep faculties of geographic information or that are interested in developing such services.

➢ With organizations that create geographical information, e.g. the Hellenic Statistical Authority, the Organization of Land Registry etc. These collaborations can include, not only the data distribution, but also the website application development, portals, with geospatial content, the conduction of workshops and other events as well as the development of digital libraries, following the example of Alexandria Digital Earth Prototype (Janee and Frew 2002).

Certain suggestions on participations in various national or even European programs, that would fund the development of applications, collections etc, can be formed by the above cooperative formations.

➢ *Heal-Link Consortium:* as Heal-link consists of the Greek Academic Libraries Consortium supports not only the access to a large amount of electronic content (journals, databases, reference material, e-books) but also the development of a variety of services which can be used by the whole academic community (e.g.Heal-legal). Heal-link deals with the requirements that the digital environment brings such as prices for the electronic content, storage and dissemination issues, therefore, it could undertake the key role of the coordinator to the development of a geospatial data collection and services. The effectiveness of this proposal requires the prior recognition by the libraries-members of the Consortium their patron's needs for geospatial information and services**.** The use of a consortium for building innovative digital library services and collections is a well tested experience not only for Greek academic libraries. In Canada, OCUL[12] (Ontario Council of University Libraries) is a consortium of 21 university libraries which enhances information services in Ontario and beyond through collective purchasing and shared digital information infrastructure, collaborative planning, advocacy, assessment, research**,** partnerships, communications, and professional development.

➢ *National Library of Greece*: the changing paradigms have different impact on academic and national libraries. Academic libraries are increasingly collaborating with the experts in geosciences which introduced their policies and activities within the traditional frames of librarians. By supporting students, scholars and researchers academic libraries have to recognize the changing nature of librarian field as well as information formats that they support (Goodchild 2000). Spatial access to diverse library holdings has not been investigated and applied in national libraries portals. The reasons can be found in GIS characteristic, spatial illiterateness and/or collections policies and tradition (Solar and Radovan 2008). But as Kotelnikova and Kildushevskaya (2004) state *"things are starting to change"*. Fleet (2004) describes in his paper the implementation of pilot web based application to provide an online spatial search methods for National Library of Scotland collections, Solar and Randovan (2008) highlight the paradigm of

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[12] http://www.ocul.on.ca/

National Library of Slovenia to explore and use advantages of GIS while National Library of Wales in its official website informs the visitor that *"Through Legal Deposit, the Library is entitled to receive a copy of every printed map and atlas published in the British Isles. Recent changes to the law mean that this will eventually be extended to include electronic mapping as well, including data created in Geographical Information Systems (GIS)"*[13]. The changing climate both in the manipulation of geospatial information by the national libraries and in the role and actions of Greek National Library after the new director's appointment generates the basis for the conformation of certain proposals:

- Exportation of the geospatial information from the material stated based on the Law L.3149/03 in the National Library and creation of an easy access to that very material for the final user.
- Participation of the National Library in national, European and international programs related to the management of geospatial information.
- Operating as an official center of instructions and standards for the geospatial information in the library environment.

10) Users' education and support: the experts in the field of libraries that occupy themselves with the geospatial collections, in the majority of their articles underline the importance of educating and supporting the users in the geospatial information, as a matter decisive for its effective use (Longstreth 1995; Cox and Gifford 1997). Facilitating intellectual access to GIS concepts and applications is the third key role that a library can have in GIS provision (after the developing of geospatial collection and GIS services and the providing access to spatial information and software tools) (Adler and Larsgaard 2002). The support and the education of the users has always been a library's "traditional" function. Previous authors' researches upon this matter have proved the provision of this function in a large number of libraries (Vardakosta and Kapidakis 2011a; Vardakosta and Kapidakis 2011b). This activity for the library can include:

- Introduction to geospatial concepts
- Introduction to case studies to promote spatial thinking and literacy
- On demand assistance to an inquiry
- Designing instructional sessions
- Consultations (i.e. scheduled appointments, hands-on assistance)
- Stand alone instructional sessions on using GIS software or locating data
- Curriculum-based instructional sessions on using GIS or locating data
- Written instructions for course assignments
- Integration of GIS into non-geospatial curriculum
- Data packages to support teaching and field work
- On-line training
- GIS demonstrations
- Advisory consultations to explore how GIS can enhance research projects
- Data searching
- Suggestions to add a GIS course on degree plan (Salem 2005; Sare et al.2013: 126)

11) Communication of collection at the Library's patrons: There are diverse communication channels that a library can use in order to populate its work. Beyond the classic channels (such as e-mail lists, posters, newsletters, brochures, information literacy programmes, announcements in library's website etc), social media can be used as well. Social media generated from many

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[13] http://www.llgc.org.uk/collections/learn-more/introduction3/

individuals are playing a greater role in our daily lives and provides a unique opportunity to gain valuable insight on information flow and social networking within a society (Stefanidis et al. 2011). Because of the ubiquity of social media use[14], academic libraries can leverage these communication tools to interact with faculty, staff, and students in new ways. Many libraries are already experimenting with different social media services like blogs[15], Twitter[16] or Facebook[17] to interact and connect with their patrons (Burkhardt 2010). The Library of Congress for instance is now making some of its photo collections available in Flickr, a popular photo sharing service (Library of Congress 2009), allowing these photos to be used as multimedia content in a variety of historical thematic maps and atlases (Lauriault et al. 2011: 27). This kind of media shift changes the way we know the world and the ways in which we generate and conceive knowledge. So, the information for the geospatial collection and the library's services through the social network, is not limited among the academic community that it serves, but it is also spread at a wide public with multiple benefits for this very organization (like the notification and promotion of its work, appealing users etc.). That way, it contributes also to the increase of its use.

 12) *Collection and Services Evaluation:* Evaluation was among the goals that ARL GIS Literacy Project included when engaged to a variety of libraries (Adler 1995). As ALA refers to its official website[18] *"collection evaluation is closely related to the goals and responsibilities of all libraries and is a valuable tool of collection management".* Collection evaluation will inform the librarian whether the established collection is relevant to the needs of the community that serves and at the same time the gathered information could support requests for additional funding. Some of the methods that the librarian can follow so to evaluate its collection and services are (Halper 2013):

- ➢ *Quantitative*, such as:
    - Circulation statistics
    - Reference requests
    - Interlibrary loan statistics
    - Webpages statistics
- ➢ Qualitative, such as:
    - Surveys
    - Focus groups

In Fig.3 we set out the above required sequence of activities in developing a geocollection.

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[14] According the White Paper entitled "Use of social media by the library: current practices and future opportunities" (2014) that Taylor and Francis researched and compiled, over 70% of libraries are using social media tools, and 60% have had a social media account for three years or longer, while 30% of librarians are posting at least daily.

[15] e.g. Manoa MAGIS http://blog.hawaii.edu/magis/

[16] e.g. GIS Data@Harvard

[17] e.g. Dalhousie University Map Collection, Donald W. Hamer Maps Library at Penn State

[18] http://www.ala.org/Template.cfm?Section=interpretations&Template=/ContentManagement/ContentDisplay.cfm&ContentID=76533
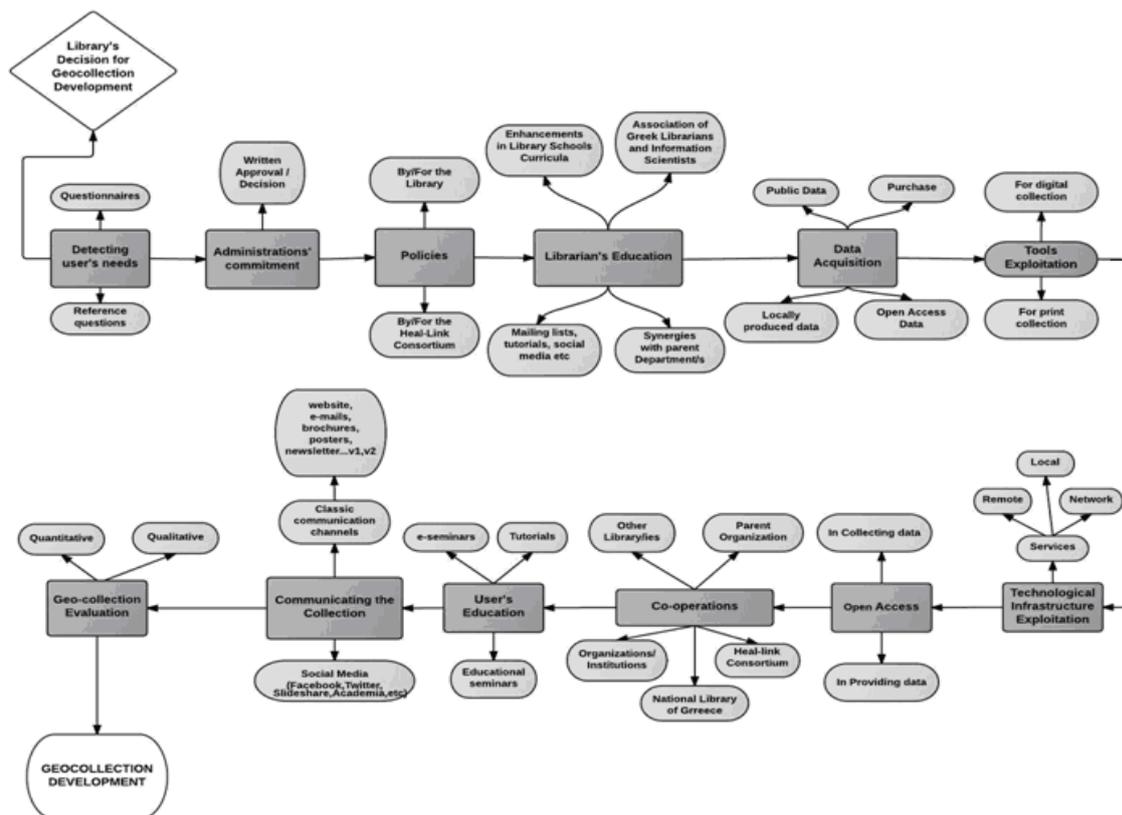
Figure 3. Geocollection development process.

Conclusions

The lack of geospatial information by the Greek academic libraries has as a result the non-covering of informational needs of the GIS users, according to the results of one of our previous researches (Vardakosta and Kapidakis 2014a; Vardakosta and Kapidakis 2014b). However, since the geospatial data starts to claim its place in academic libraries users' informational needs, the library is obliged to find ways for these users to be served. This study aims to cover the gap in Greek Librarianship literature (and not only in local level) and also to provide guiding instructions to librarians concerning the geospatial collection development in an academic environment.

The suggestions stated, in limited extent, due to the study extension, underline that the geospatial collection development is a dynamic, multilevel procedure which involves many stakeholders (the personnel, the faculty administration, the users, the library partners). One further purpose of this study, is firstly, to raise discussion among the librarians of the country about the development of the geospatial information and its promotion through various actions. Secondly, someone may wonder to what extend a library, that undergoes economical cuts of its annual budget (or even suffers from its total absence), or that operates under reduced personnel, like many academic libraries in Greece, is in position to apply these suggestions. To form all the above suggestions, two key-factors were used (which partially answer the above question): open access and collaborations, the use of which limits the economical cost required for the development of a geospatial information collection. We believe that the issue which requires adequate research and comes as a potential need for all the libraries, is the composition of a policy tool, that would be used by any library that decides to participate in developing a geospatial collection for covering the educational/searching needs of its users and its public.

Lamont and Marley (1998) argue that the implementation of GIS will be as many as the institutions because each one has a different mission and user base. Similarly, Stone Muilenberg (2001: 59) claims that there is no set formula for establishing GIS services in a library, while Florance (2006) states that "a GIS collection is not built over a month or a year but natures over time". We believe that Greek academic libraries have reached the maturity level required for turning their attention to the geographical information and we hope that our suggestions become a strong aid in their effort.

Bibliography

Abbott, L.T. and C.D. Argentati (1995). GIS: a new component of public services. *The Journal of Academic Librarianship* 21(4): 251–256

Abresch J. e.a. (2008). Integrating Geographic Information Systems into Library Services: a guide for academic Libraries. Hershey, London: IGI Global Adler, 1995

Adler, P.S. & M.L. Larsgaard (2002). Applying GIS in libraries. In P. Longley, ed. *Geographic Information Systems*. Chichester,New York: Wiley

Antonelli S. (1999). Breaking With Conventions: What Does Digital Spatial Data Require? *LIBER QUARTERLY* 9: 149-161

Argentati, C.D. (1997). Expanding horizons for GIS services in academic libraries. *The Journal of Academic Librarianship* 23(6): 463–468.

Branin J., F.Groen and S.Thorin (2000). The changing nature of Collection Management in Research Libraries. *Library Resources and Technical Services (LRTS)* 44(1): 23–32.

Buhler J. (1999). Digital Maps in Map Collections -Presenting New Electronic Media *LIBER Quarterly* 9: 228-234

Burkhardt, A. (2010). A guide for college and university libraries. *College & Research Libraries News* 71(1): 10-24

Cline N. M and P. Adler (1995). GIS and research libraries: one perspective. *Information Technology and Libraries* 14(2):111-115

Cox, A.B. and F. Gifford (1997). An Overview to Geographic Information Systems. *The Journal of Academic Librarianship* 23(6): 449–461.

Fleet C. (2003). The Legal Deposit of Digital Geospatial Data in the United Kingdom. *LIBER Quarterly 13*: 28–38.

Florance, P. (2006). GIS collection development within an academic library. *Library Trends* 55(2): 222–235.

Gabaldon, C. and J. Repplinger (2006). GIS and the Academic Library:a survey of libraries offering GIS services in two consortia. *Issues in science and Technology Librarianship In digital form,* http://www.istl.org/06-fall/refereed.html

Gao S.-J., J.X. Guo, X.-L. Duan (2011).The study of library use and document gathering behavior: A survey of geomatics faculty at Wuhan University, China. *Library Collections, Acquisitions, and Technical Services*, 35(1): 19-28

Georgiadou P.Y.et.al. (2009) Framing the use of geo - information in government: a tale of two perspectives. *Earth science informatics* 2(4):271-282

Goodchild M.F. (2000). Cartographic perspectives on a digital future. Cartographic Perspectives 36: 1-19

Grimshaw D. (2000). *Bringing geographical information systems into business*. New York: Wiley.

Halper S. (2013) Collection evaluation techniques for academic libraries. In digital form, http://www.slideshare.net/alissinfo/collection-evaluation-techniques-for-academic-libraries

Hanson, A. and S. Heron (2008). Describing Geospatial Information. In Abresch, J. et.al (eds), *Integrating Geographic Information Systems into Library Services*. Hershey,New York: Information Science Publishing.

Jackson et.al. (2009). The Evolution of Geospatial Technology Calls for Changes in Geospatial Research, Education and Government Management. In digital form, http://www.directionsmag.com/entry/the-evolution-of-geospatial-technology-calls-for-changes-in-geospatial-rese/122571

Janee, G. and J. Frew (2002). The Alexandria Digital Library Architecture. In digital form, http://oook.info/sabb/adeptdigilib.pdf

Kinikin J. and K. Hench (2005). Survey of GIS implementation and use within smaller academic libraries. *Issues in science and Technology Librarianship* in digital form, DOI:10.5062/F4SX6B56

Kotelnikova N. and L. Kildushevskaya (2004). Development of geographic information systems and their use in national libraries of Russia. In digital form, http://liber-maps.kb.nl/articles/14kotelnikova.html

Lamont M. (1997). Managing geospatial data and services. *Journal of American Librarianship* 23(6): 469–473.

Lamont M. and C. Marley (1998). Spatial Data and the Digital Library. In   *Cartography & Geographic Information Systems* 25(3)

Larsgaard M.L. (1998). Availability of geospatial data through libraries in the United States (2). In *Policy issues in Modern Cartography*: 159–184.

Lauriault T.P., P.L. Pulsifer and D.R. Fraser Taylor (2011). The Preservation and Archiving of Geospatial Digital Data: Challenges and Opportunities for Cartographers in M. Jobst (ed.), Preservation in Digital Cartography, Lecture Notes in Geoinformation and

Cartography. Berlin,Heidelberg: Springer-Verlag. DOI 10.1007/978-3-642-12733-5_2

Liarou, M. (2015). Adoption of GIS services in academic libraries. Master Thesis (unpublished). Universtiy of Maccedonia In digital form, https://dspace.lib.uom.gr/handle/2159/17046

Library of Congress (2009). Library of Congress Flickr pilot. In digital form,

http://www.flickr.com/photos/library_of_congress/collections/721576013555

24315/

Longstreth, K. (1995). GIS collection development, staffing and training. *The Journal of Academic Librarianship 21(4):*267–274.

Loenen, B. Van and H. J. Onsrud (2004). Geographic Data for Academic Research: Assessing Access Policies. *Cartography and Geographic Information Science 31*(1): 3–17.

Macfarlane,C.M. and C.M. Rodgers (2008). Geospatial technology support in small academic libraries: time to jump on board? *Issues in science and Technology Librarianship* In digital form, http://www.istl.org/08-fall/article6.html

March, G.H. (2011). Surveying Campus GIS and GPS Users to Determine Role and Level of Library Services In *Journal of Map and Geography Libraries* 7(2): 154-183 DOI:10.1080/15420353.2011.566838

Moore, J. (2005) Digital Map Soup: what's Cooking in British Academic Libraries and are we helping our Users? *LIBER Quarterly* 15(1) In digital form, http://liber.library.uu.nl/index.php/lq/article/view/7800

Nedas K. et al. (2010) Building the Hellenic National Geospatial Data Infrastructure from Scratch: Challenges, Legislation, Progress and Experiences. In digital form, http://inspire.ec.europa.eu/events/conferences/inspire_2011/presentations/196.pdf

Parihar, S.M. (2002). Higher education in spatial information industry: A case for promoting mutual interest in geography at University level. Geospatial information portal: Papers and articles in education

Phadke, D.N. (2006) Geographical Information Systems (GIS) in Library and InformationSystems. New Delhi: Concept Publishing Company

Salem Jr., J. A. (2005). Spatial Data Collections and Services. *ARL SPEC KIT291*.

Scaramozzino J. e.a. (2014) Map Room to Data and GIS Services: Five University Libraries Evolving to Meet Campus Needs and Changing Technologies. *Journal of Map and Geography Libraries* 10 (1): 6-47 DOI**:**10.1080/15420353.2014.893943

Scarletto, E. (2011). Collection Development Guidance through Reference Inquiry Analysis: A Study of Map Library Patrons and Their Needs. Journal of Map and Geography Libraries 7(2): 124-137

Shawa, T.W. (2002). What should a GIS Librarian do? American Library Association. Map and Geography Round Table. Atlanta, June 17. In digital form, http://www.ala.org/magirt/sites/ala.org.magirt/files/content/Archives/whatgis.pdf

Stenval J. (2003). The Challenge of Preserving Digital Maps. *LIBER Quarterly, the Journal of European Research Libraries* 13: 57–63

Solar,R. and D. Radovan (2008): The change of paradigms in digital map libraries. *e-Perimetron* 3(2):53-62

Stone-Muilenburg, J. (2001). The changing role of GIS in the map room In *The Map library in the new millennium* (eds.) R.B.Parry and C.R.Perkins, Chicago: ARL

Szaniawska, L. (2003). The New Map Department in the National Library of Poland and the first steps to the Automation of Cataloguing its Collections. *LIBER Quarterly* 13: 48–54.

Stefanidis A., A. Crooks and J. Radjikowski (2011). Harvesting ambient geospatial information from social media feeds. *GeoJournal* DOI 10.1007/s10708-011-9438-2 http://css.gmu.edu/andrew/pubs/Geojournal.pdf

Sweetkind-Singer, J., and M.J. Williams. (2001) Supporting the Needs of Geographic Information Systems Users in an Academic Library. *Science & Technology Libraries* 21 (3/4) In digital form, https://lib.stanford.edu/files/GIS_Academic_Library.pdf

Todd, J.L.(2008). GIS and libraries: a cross-disciplinary approach. *Online* 32(5):14–18.

Vardakosta I., E. Koufakou and M. Bekatoros (2013). Contribution of self-archiving to the implementation of open access policies: The case of the Institutional Repository ESTIA of Harokopio University. *In International Ope*n Access Conference @ EKT: Towards Common European Policies for Innovative Reuse of Public Sector and Scientific Information In digital form, http://eprints.rclis.org/20574/

Vardakosta, I. and S. Kapidakis. 2011. Geographical collections in Greek academic libraries: current situation and perspectives. In *International Conference on Integrated Information (IC-ININFO)* Kos-Greece. In digital form, http://eprints.rclis.org/handle/10760/16169#.TqRt2XI9K3c.

Vardakosta, I. and S. Kapidakis. (2012). Geospatial Data in Library Collections. In *5th International Conference on PErvasive Technologies Related to Assistive Environments (PETRA).* Hersonissos, Crete, Greece. In digital form, http://eprints.rclis.org/17450/

Vardakosta, I. and S. Kapidakis (2012ª). Geospatial data collection development policies' characteristics. In *41st Annual LIBER Conference*, Tartu In digital form, http://eprints.rclis.org/17448/

Vardakosta, I. and S. Kapidakis (2012b). GIS Librarian: exaggeration or necessity? In 21st Panhellenic Conference of Greek Academic Libraries. In digital form, http://eprints.rclis.org/18120/   [in Greek]

Vardakosta, I. and S. Kapidakis (2013). The New Trends for Librarians in Management of Geographic Inofrmation. *Procedia-Social and Behavioral Sciences* 73:794-801

Vardakosta I. and S. Kapidakis (2011). *Geospatial collection development policies in academic libraries: a worldwide research.* In 17th European Colloquium on Quantitative and Theoretical Geography (ECQTG2011), In digital form, http://eprints.rclis.org/16096/

Vardakosta, I. and S. Kapidakis (2014a). Users perspectives for geospatial collections development in an open access era:The case of Greek libraries. In British Cartographic Society-Map Curators Group Workshop, Birmingham (UK), 9-10 September 2014 In digital form, http://eprints.rclis.org/23779/

Vardakosta, I. and S. Kapidakis (2014b). Strategic considerations for geospatial collection development from Greek Academic Libraries in an open access era: GIS users point of view In 10th International Congress of the Hellenic Geographical Society.Aristotle University of Thessaloniki, 22-24 Oct. In digital form, https://www.academia.edu/9064544/Strategic_considerations_for_geospatial_collection_development_from_Greek_Academic_Libraries_in_an_open_access_era_GIS_users_point_of_view

Yazdi, F. A and N.J. Deshpande (2013). Evaluation of selected library associations' web sites. *Aslib Proceedings* 65(2): 92–108