



The Provision and Sustainability of GIS Services: How an Academic Library without a GIS Specialist Provides GIS Services

Wenli Gao, and Yongming Wang

Abstract:

This paper presents a case study of how one academic library provides services and support for the Geographic Information System (GIS) needs of students and faculty. The case study involves an American university library that has provided GIS services to meet the needs of students and faculty while lacking the formal position of a dedicated GIS Librarian. The library's variety of GIS-related support is described in the paper, and an overview of resources for librarians to develop their GIS skills is also shared. The paper offers insights and lessons learned about the level of services that can be offered by academic libraries in GIS-related research and training for students, faculty, and staff.

To cite this article:

Gao, W., & Wang, Y. (2020). The Provision and Sustainability of GIS Services: How an Academic Library without a GIS Specialist Provides GIS Services. *International Journal of Librarianship*, 5(1), 53-60. <https://doi.org/10.23974/ijol.2020.vol5.1.160>

To submit your article to this journal:

Go to <https://ojs.calaijol.org/index.php/ijol/about/submissions/>

The Provision and Sustainability of GIS Services: How an Academic Library without a GIS Specialist Provides GIS Services

Wenli Gao, University of Houston, Texas, USA

Yongming Wang, The College of New Jersey, New Jersey, USA

ABSTRACT

This paper presents a case study of how one academic library provides services and support for the Geographic Information System (GIS) needs of students and faculty. The case study involves an American university library that has provided GIS services to meet the needs of students and faculty while lacking the formal position of a dedicated GIS Librarian. The library's variety of GIS-related support is described in the paper, and an overview of resources for librarians to develop their GIS skills is also shared. The paper offers insights and lessons learned about the level of services that can be offered by academic libraries in GIS-related research and training for students, faculty, and staff.

Keywords: GIS, GIS Service, Research Libraries, Academic Libraries

INTRODUCTION

When the concept of Geographic Information System (GIS) came to light in the early 1990s, it was marked by two significant events: the 1990 U.S. Census Bureau release of TIGER/Line files to Federal Depository Library Program (FDLP) Libraries, and the 1991 release by ESRI, an international supplier and builder of GIS software, of ArcView. With the availability of these data resources and products, academic libraries in North America were able to provide GIS service and support to college and university students and faculty in relevant disciplines (March & Scarletto, 2017). These services are mostly concentrated in large and research-oriented institutions. Due to a variety of factors such as the hiring of professional librarians trained in GIS, and library spending devoted to GIS and data-related resources, different service models grew from informal and casual support to having dedicated GIS centers or trained GIS librarians in the library to support research and training for students, faculty, and staff. Services also included helping subject librarians who needed training with GIS resources to support their departments. In this paper, we will talk about how the GIS services at UH are supported and provided without a dedicated GIS librarian.

The University of Houston (UH) is an urban, public, tier one research institution. In 2015, the Libraries hired its first Social Sciences Data Librarian to start data services in disciplines such as Political Science, Education, Communications, History, and other related fields. Before joining UH, the Social Sciences Data Librarian had over 10 years of experience as a GIS librarian. As a result, a lot of the research support focused on GIS, embarking the UH Libraries efforts to offer GIS support to the campus. At the same time, as demands for GIS support emerged, it inspired

interested liaisons to seek professional development opportunities to enhance GIS skills. Upon the departure of the first Social Sciences Data Librarian in early 2017, the Libraries hired another data librarian, with an expectation to provide a wide range of data services, such as locating data, data wrangling, and data visualization. It was also expected to maintain the basic existing support for GIS, while not actively promoting the service because of the limited number of personnel available to support it.

LITERATURE REVIEW

The most notable event in the 1990s that involved academic library GIS support was the Association of Research Libraries (ARL) GIS Literacy Project (Davie, Fox & Preece, 1999). This project was a collaboration between ARL and ESRI to train academic librarians in the areas of GIS knowledge and applications. Thanks to this project, “During the 1990s, GIS began to be supported by library staff from a variety of departments such as maps, government documents, data services, reference, and systems” (March & Scarletto, 2017).

However, in the 1990s there were very few GIS librarians available. Most GIS support was provided by librarians who were not systematically trained in GIS, but had a varying degree of GIS training either through the ARL GIS Literacy Project or other training opportunities. According to Cheverie (1995), training on GIS can be difficult. The learning curve is steep, and GIS software is not easy to master. Suh and Lee (1999) suggested that, “a specialist librarian should be designated for GIS and he/she should receive continuous training to update skills.”

From the start of the 2000s, many academic libraries that had mainly provided informal GIS services realized that there was sufficient demand for a GIS librarian or GIS center in the library and therefore set about to devise plans to determine how to fund, staff, and locate these services. For example, in 2000 Stanford University’s Earth Science Library staffed these positions, a GIS manager, Map and GIS librarian, and a GIS specialist (Sweetkind-Singer & Williams, 2001). Syracuse University Libraries created the GIS Lab with one GIS/Map librarian and several graduate student assistants. The service provided by the library’s GIS Lab included ESRI software installation and troubleshooting, workshops, consultation, and other GIS-related reference questions and answers (Olson, 2004). In 2002, Kansas University Library started the Library GIS and Data Lab to provide GIS services and geospatial data collection to the campus and general public. Within five years of the lab opening, the library hired a GIS Specialist, Map Librarian, Data and Government Information Librarian, and a Statistical Consultant. The lab was open about sixty hours per week (Houser, 2006). In 2001, Harvard University Library’s Geospatial Library opened, and its Center for Geospatial Analysis started in 2006 (Guan, 2011).

From 2010 to 2019, many more large university libraries and research libraries have set up dedicated GIS labs or services staffed with specialized GIS librarians or other functional data specialists. The service models have also developed to include all-round services with collaboration with different units of the university including the IT departments (Scaramozzino et al, 2014). Not only have general GIS support and services become popular among these large libraries, but their GIS service has become more integrated with certain disciplines also. The Purdue University library’s GIS service has co-developed a program with the school’s humanities and social science department to better serve the university mission (Kong et al, 2017).

In an editorial in the *Journal of Map and Geography Libraries* published online in September 2019 (volume 14 issue 2-3), the authors talk about the three paradigm shifts in the GIS field for the past 25 years. The first paradigm started in early 1990 with the introduction of availability of digital census data and the ARL GIS Literacy Project ushering in the ability for academic libraries to begin introducing GIS services; the second paradigm shift coincided with the massive digitization of library print cartographic collection starting in early 2000s. Now we are in the middle of third paradigm shift (Bidney & Piekielek, 2018). This shift, the authors argue: "...marked a transition from looking at print cartographic collections as objects to digitize and make available to the world, to looking at collections (regardless of format or ownership) as critical information resources that contribute to the multi- and inter-disciplinary research environment—sometimes even as the key to pulling together understanding from different disciplines in the sense of geographic space as an integrator of disciplinary knowledge" (2018).

CASE STUDY

GIS support provided

License support

UH has a campus wide license through Esri, a leading company in the GIS industry. The data librarian administers the ESRI product ArcGIS desktop licenses to students. Upon request, the librarian will distribute one-year student license keys, as well as providing instruction and troubleshooting for installation. Since GIS services are not widely promoted, most of the reference questions relating to GIS comes from students who requested license, or students in classes or workshops.

Workshops

Beginning in fall 2018, UH Libraries started to offer a series of one-hour workshops for faculty, staff, and students to hone their skills on a variety of research tools. In this first run of research workshops, two GIS related workshops were taught by the data librarian, Introduction to ArcMap and Online mapping with ArcGIS online. Both workshops required no prior knowledge of GIS, but required a registration using UH email credentials. The Introduction to ArcMap workshop provided an overview of how ArcGIS software can help researchers analyze or visualize digital data that has a locational component. The learning outcome was for participants to become familiar with the ArcGIS interface, and be able to create a simple map using the ArcMap software. In this hands-on session, participants created a simple map, edited the layout, and exported the map into different formats. In the Online mapping with ArcGIS online workshop, participants learned basic terminologies for GIS and identified opportunities to apply GIS in their work. Participants also learned how to use ArcGIS online to create a map with lines, points, and polygons. Since the preparation of these workshops happened shortly after Hurricane Harvey, the librarian used real data to create a Houston hurricane evacuation map and see where the city of Houston's non-emergency service calls were received to report flooding during Hurricane Harvey. Participants also learned to add demographic data to the map and identify areas that needed more assistance during the evacuation. The tie-in with a major event in the city attracted a lot of interest in the campus community at that time. For both workshops, the data librarian introduced learning

resources to explore more GIS applications.

In spring 2019, besides the previous offerings, two additional GIS workshops were added, Geocoding and Mapping Location Data and Mapping Census Data. Participants were strongly encouraged to take Introduction to ArcMap prior to these two workshops. In the Geocoding and Mapping Location Data workshop, participants learned a few ways to geocode, the process of converting addresses (like a street address) into geographic coordinates (like latitude and longitude), and learned how to retrieve location data from library databases, geocode them, and place them on the map. In the Mapping Census Data workshop, participants learned how to retrieve census data and join the data with census TIGER shapefiles, a public domain data source which has many geographic features. Using ArcMap, participants created choropleth maps, thematic maps in which areas were shaded in proportion to the measurement of the statistical variable being displayed on the map, such as population density or per-capita income. Both of these workshops also served a way to promote the use of library databases, such as ReferenceUSA for retrieving location data, and Social Explorer for retrieving census data.

Intended to align with campus priorities and focus more on other research topics such as data management and data visualization, the research services team at UH Libraries decided to move GIS-related open workshops to workshops by request in fall, 2019. By filling out an online form, researchers could request specific GIS topics for their classes and research groups. This change enabled the librarian to provide more tailored workshops that better fit researchers' needs.

Course related instruction

Besides open workshops, the data librarian also provides course integrated GIS training in the undergraduate and graduate curriculum. Most of the training happens in architecture, health education, and economics where the use of GIS applies to a variety of projects. In this case study, examples from both an undergraduate course and a graduate level course are discussed to show the different levels of support. Both courses work on projects that partner with local GIS offices.

HLT 3300 was a social health and wellness undergraduate course at UH. It explored social factors associated with the health and wellness of populations defined by sociodemographic characteristics including, but not limited to race, sex, and social class. In recent years, students worked on a real project that involved the mapping of sidewalk conditions. It was a collaboration with the Kinder Institute for Urban Research at Rice University, which is a multidisciplinary research center in central Houston, focusing on urban issues in Houston, the American Sun Belt and globally. Through informed research, data and policy analysis, the Kinder Institute hopes to “engage civic and political leaders to implement solutions to critical urban issues, including education, governance, housing, mobility and transportation, resilience, and demographics” (Kinder Institute for Urban Research, 2020). Each semester, students went on field trips to observe the sidewalk conditions on whether it had sidewalks, and the accessibility for pedestrians. Students gathered the data manually, on a sheet of paper, uploaded the data into a spreadsheet, and created maps based on real-life conditions. Often times, maps for roads existed, but data for conditions of roads was not available. The faculty member was in charge of the logistics of arranging the field trips and gathering the raw data. The Kinder Institute for Urban Research provided shapefiles for the streets students worked on, and personnel to help students with questions. The role of the data librarian was to work with the faculty to identify skills needed for students to create the map. After discussing with the faculty, topics covered for the class included: examples of public health

mapping using ArcGIS, an introduction of ArcMap, joining data to shapefile, changing symbology and exporting the map. The purpose of having examples of the use of GIS in public health was to show students the various applications of GIS, so that they could make a better sense of how and why they were trained. An introduction of ArcMap, including its basic functions, formed the basis for students to create a map later. The most challenging part of the class was to join the data from spreadsheet to the shapefile. Students were instructed to join a table of data from an excel file to a layer in ArcMap based on the value of a field that could be found in both tables. After successfully joining the data, students used the symbology tool to visualize different features of the sidewalk conditions. No formal assessment was conducted during the classes, but students needed to create a map based on the data they collected in a group.

ECON 7387 Urban Economics was a PhD level course focusing on markets for housing and sites, and determinants of land use patterns. Topics included demand, rent and density gradients, racial discrimination, land use regulation, and transportation access. It uses resources from the Houston-Galveston Area Council (H-GAC), which is the regional organization through which local governments consider issues and cooperate in solving area wide problems. There were two GIS trainings for this course. The first one was to give students basic understanding of GIS and create choropleth maps. Students learned to add lines, points, and polygons to the map, and used census data to create a shaded map. The second assignment was more challenging. Students were given housing address data and flood zone data. They needed to use GIS to determine on which flood zone the house was located. To complete this task, they needed to learn spatial join, a type of table join operation in which fields from one layer's attribute table were appended to another layer's attribute table based on the relative locations of the features in the two layers. This is a unique function only performed in GIS software rather than more frequently used statistical software. Moreover, the data they worked with were very large, taking more than three hours to process. As a result, students also needed to learn how to clip a sample data and process that in class, and later work on the real dataset. Both sessions were hands-on, and learning resources, such as LibGuides and video tutorials were created to help students retain the information.

Developing GIS skills for librarians

There are several in-person and online opportunities for librarians to develop their GIS skills without having formal education in GIS. Some are free, while some are fee based. One free option librarians can take advantage of is to audit GIS-related courses on campus. Many universities have course offering relating to mapping, although not necessarily with GIS in the course title. Librarians could reach out to the faculty and investigate the possibility to observe these kinds of courses. The data services librarian at UH observed GIS for Humanities and Social Sciences, a semester-long 3-credit graduate course. This course provided the foundation for the data librarian to further develop skills in GIS. For librarians with no prior GIS experience, it is suggested to take courses outside of GIS major areas, however those courses might be too in depth for beginners. A course in the social science field that covers applications of GIS in a variety of areas is a better fit and might be more suitable for librarians without a science background. Another in-person training option is the Harvard GIS institute offered by the Center of Geographic Analysis from Harvard University. This is a two-week training course with one week of lecturing and hands-on training, and one week of applying this knowledge to the trainee's own project. Examples of topics covered in the training are introduction to GIS, basic mapping in GIS, geocoding and georeferencing, spatial analysis, 3D visualization, and cartography and data management. In this case study, since

most of the data librarian's role was to support faculty research projects, instead of having their own projects, the librarian was able to negotiate with the trainer before applying to attend the first half of the institute, and had the tuition significantly reduced. For librarians without sufficient funding for this training, the learning materials for the Harvard GIS institute are available on their website. Librarians can conveniently take advantage of the materials and learn on their own.

Online training courses are another option for librarians to develop their GIS skills. Coursera, an online learning platform offering a large variety of open online courses, specializations, and degrees, has free courses on GIS. ESRI also provides a suite of online asynchronous e-learning resources, encompassing a collection of intensive interactive training courses covering everything from the basics of making maps to advanced spatial analysis. These courses include conceptual material and presentations, hands-on software exercises, and exams. For example, Learning ArcGIS Desktop, a 31-hour web course offered by Esri, provides librarians a good overview and fundamental knowledge to start offering services in GIS. Teaching with GIS: Introduction to Using GIS in the Classroom, a 5-hour web course offered by Esri, focuses on integrating GIS into the curriculum and offers recommendations and ideas on how to work faculty to apply GIS in their courses.

Another way for librarians to develop their skills in GIS is to follow GIS related listservs. The Esri Higher Education Listserv is a moderated list for the Esri higher education community. Librarians and faculty can post information and questions related to teaching and research at colleges and universities. GIS for libraries (Gis4lib) is an email list for discussion of providing GIS services specifically in libraries, including academic, public, private, and corporate. Topics may include discussion of hardware, software, data acquisition, licensing, collection development, and more. The Western Association of Map Libraries, an independent association of map librarians and other people with an interest in maps and map librarianship, has a resource page on map librarianship discussion lists (<http://www.waml.org/maplists.html>). It includes listservs for different regions and librarians can join appropriate listservs based on their interest and geographic location.

CONCLUSION AND DISCUSSION

The demand for providing GIS services now exists in most academic libraries, especially in the humanities and social science areas. Within digital humanities, more and more researchers would like to work with historical maps or be able to visualize their research on maps. In social science subjects, GIS helps advancing research, especially in mapping trends based on demographic and economic features. Providing basic introductory-level GIS services can help bridge this gap, and while it is feasible for librarians to develop skills and provide this level of service, it will be hard to escalate the level of service without more personnel or a dedicated GIS librarian.

At UH, with these similar limitations on its current resources, the goal is to maintain requests coming from faculty and students, without actively promoting the service. Barriers still exist for libraries to provide a robust GIS service without a GIS specialist. Preparing a librarian to provide basic GIS services requires a lot of time and motivation for training. Usually the librarian has other job responsibilities and has to make an extra effort to devote the time and energy needed for mastering a new skill. Becoming adept at using GIS software and maintaining proficiency in it, as well as having access to ongoing training, is also important. Even with training, the librarian

often lacks solid fundamental knowledge in GIS that would otherwise build gradually within a degree program. Having a dedicated and full time GIS librarian is recommended if the campus has a demonstrated and growing need for GIS and if there is a budget for it.

References

- Bidney, M., and Piekielek, N. (2018). Towards a New Paradigm in Map and Spatial Information Librarianship, *Journal of Map & Geography Libraries*, 14(2), 67-74. doi: <https://doi.org/10.1080/15420353.2019.1662673>
- Cheverie, J. F. (1995). Getting started: Ready, set, ... Get organized! *Journal of Academic Librarianship*, 21(4):292–296. doi: [https://doi.org/10.1016/0099-1333\(95\)90011-X](https://doi.org/10.1016/0099-1333(95)90011-X)
- Davie, D. K., J. Fox, and B. Preece. (1999). ARL Geographic Information Literacy Project. ARL SPEC Kit 238 and SPEC Flyer 238. Washington, D.C.: Association of Research Libraries. <http://eric.ed.gov/?id=ED429609>.
- Guan, W. W., Burns, B., Finkelstein, J. L., and Blossom, J. C. (2011). Enabling geographic research across disciplines: Building an institutional infrastructure for geographic analysis at Harvard University. *Journal of Map & Geography Libraries*, 7(1), 36–60. doi: <http://doi.org/10.1080/15420353.2011.534688>
- Kinder Institute for Urban Research. (2020). Building better cities, building better lives. <https://kinder.rice.edu/about> (accessed May 4, 2020)
- Kong, N., Fosmire, M., & Branch, B. (2017). Developing Library GIS Services for Humanities and Social Science: An Action Research Approach. *College & Research Libraries*, 78(4), 413-427. doi:<https://doi.org/10.5860/crl.78.4.413>
- Houser, R. (2006). Building a library GIS service from the ground up. *Library Trends*, 55(2), 315–326. <http://kuscholarworks.ku.edu/handle/1808/1113> (accessed May 3, 2020).
- March, G. & Scarletto, E. (2017). The Evolution of GIS Services with North American Academic Libraries: Documenting Change through the Decades (1995 – 2016). *Journal of Map & Geography Libraries*, 13(2), 222-245. doi: <https://doi.org/10.1080/15420353.2017.1313803>
- Olson, J. A. (2004). Library-based GIS labs. *Journal of Map & Geography Libraries*, 1(1), 75–88. doi: https://doi.org/10.1300/J230v01n01_05
- Scaramozzino, J., White, R., Essic, J., Fullington, L. A., Mistry, H., Henley, A., and Olivares, M. (2014). Map room to data and GIS services: Five university libraries evolving to meet campus needs and changing technologies. *Journal of Map & Geography Libraries*, 10(1), 6–47. doi: <https://doi.org/10.1080/15420353.2014.893943>
- Suh, H.-S., and Lee, A. (1999). Embracing GIS services in libraries. *The Reference Librarian*, 30(64), 125–137. doi: https://doi.org/10.1300/J120v30n64_10
- Sweetkind-Singer, J., and Williams, M. (2001). Supporting the information needs of Geographic Information Systems (GIS) users in an academic library. *Science & Technology Libraries*, 21(3–4), 175–190. doi: https://doi.org/10.1300/J122v21n03_11

About the authors

Wenli Gao is the data services librarian at University of Houston, where she provides research support and instruction in methodologies and tools relating to Geographic Information Systems (GIS), analysis and visualization of data. Wenli received her Master of Library Science from Syracuse University, and an MS in Communication Media Technologies from Rochester Institute of Technology.

Yongming Wang is the systems librarian at The College of New Jersey. He received his MLS from Rutgers University. His research interests include library service platform, data science and artificial intelligence, linked data, and research data management.