

Use of geographical information system (GIS) application in public libraries

Abid Hussain

Introduction

A global information system (GIS) is an application that creates, manages, analyses and maps all kinds of data. The primary function of GIS is to connect data with a map. It has been one of the emerging technologies for the past few decades. It is an application that organizes data and displays it on its geospatial characteristics. The word GIS was coined by Tomlinson (1998), a renowned Canadian geologist, earlier in 1960. He was the leader of the first industry-scale computer-based GIS, geographical information system. He further explained that any computer application that performs functions with geospatial data is the data related to space. GIS combines multiple data sets in any discipline using geographical references. It has become a versatile research tool in multiple fields that deals with the data set's contextualization based on its relationship to its physical environment. It also combines disparate data in one data set. It connects users to visualize large quantities of data in one place. GIS, remote sensing and similar geospatial data play a tremendous role in public services, policy-making planning activities, community development and community participation (Caldwell, 2009). GIS combines character-based and visual information from various sources and integrates them into intelligent visual maps and diagrams. In the past, GIS was used for topographic or planimetric surveys, parcels or mapping property, but its role has been expanded in different businesses and institutions. GIS has been implemented in institutions to effectively share information in times of scarce resources for economic benefit. Aforementioned that GIS has become a versatile technology in different trades (see Figure 1).

Public libraries deal with information on a larger scale. It serves the community

of all ages without caste, creed and colour. The primary function of GIS in a public library is to connect all sorts of disparate data in one data set. The connectivity of GIS with public libraries will bring positive changes to its services. The present study sheds light on GIS application in public library scenarios. It would explain various functions of GIS, its usage, scope, functions and challenges library staff face while implementing this robust technology. GIS, remote sensing and geospatial applications are beneficial applications for a public library that will visualize the collections, connect the users with rich resources and contextualize all information in one data set.

Research questions

The study addresses the following questions in detail:

- RQ1. What is the relationship between GIS and public library?
- RQ2. How GIS application can help the public library in promoting their services?
- RQ3. What are the various challenges faced by the librarians in implementing GIS technology in public library scenario?

Significance of the study

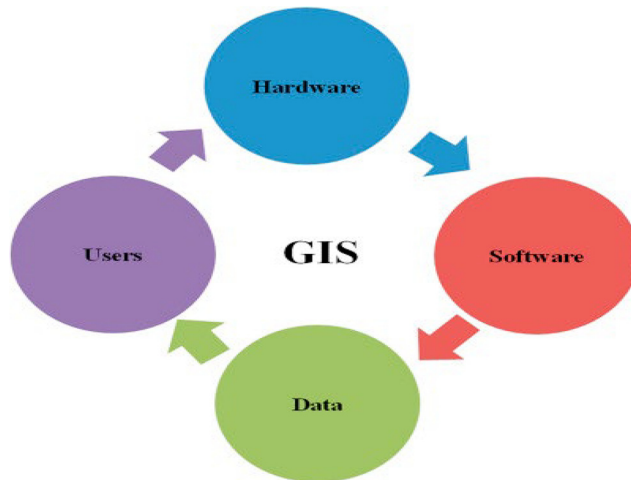
Public libraries are designed to serve the local community with rich information resources; however, people do not find time to visit libraries physically. In such a situation, it is crucial to use these resources. GIS applications are designed and adopted by different libraries worldwide to show the maps of collections, support research activities and provide adequate access to spatial information housed in public libraries. The finding of this

study would help to understand the essential functions of GIS and its core value in public library scenarios. The study also highlights the prospects and challenges of GIS in the public library and its solution for better understanding.

Geographical information system: an assessment tool

GIS provides corroboration in reliable data on ground observation. Public libraries administrators always have little room for error; GIS will possibly help them in such financial budget constraints. We know that GIS has now become an integrated decision support tool for all kinds of businesses; similarly, library manager will use the services of this technology before planning any strategy. Library personnel should fully understand GIS data and population while designing facilities for the general masses. Using GIS in information collection, programmes and delivery points aligns closely with constituents' needs. It will help in a more extensive view of the in-house library. Public libraries face financial constraints for purchasing new materials and other things; GIS will help to create a complete account of how a public library can facilitate the needs of the local community. It can be used to provide a quantitative measure for the social activities taking place inside the library. In one of his articles, Lauren Mandel has articulated that by mapping a library's social activities, GIS can better help them in the workflow chart of library activities. He further quoted that the Microsoft Office suite, in conjunction with MapWindow, an open-source GIS tool, can help to overlay the floor plan of a library building with data points that can capture patron's use of the space. Creating such a map at some level is

Figure 1. *How GIS works in public library*



Source: Janipella *et al.* (2019)

known as GIS planning in a public library. It can also help library administrators identify building use cycles based on the time of day or seasons of the year. It indicates traffic problems in plan programmes and also can showcase new acquisitions. Jingfena Xia, a library space management expert, stated that GIS is beneficial in checkout rates of items housed in shelvings of different heights in a library. He stated that it could check out the correct information misplaced on the shelves of the libraries. GIS can also be used to assess the imbalance use of the library's collection.

Public libraries

According to World Encyclopedia, "A public library is a library that is open to the public and generally funded by taxes at the municipal, district covering several municipalities, county, state, or federal level" (Rollins, 1995).

Public libraries exist in most nations of the world. They are often considered essential to having an educated and literate population. The public library is a gateway to knowledge. It is a source of lifelong learning, cultural development and individual independent decision-making. It is an excellent source of information for the local community and social groups. Public libraries not only provide books, periodicals and newspapers, but it is a

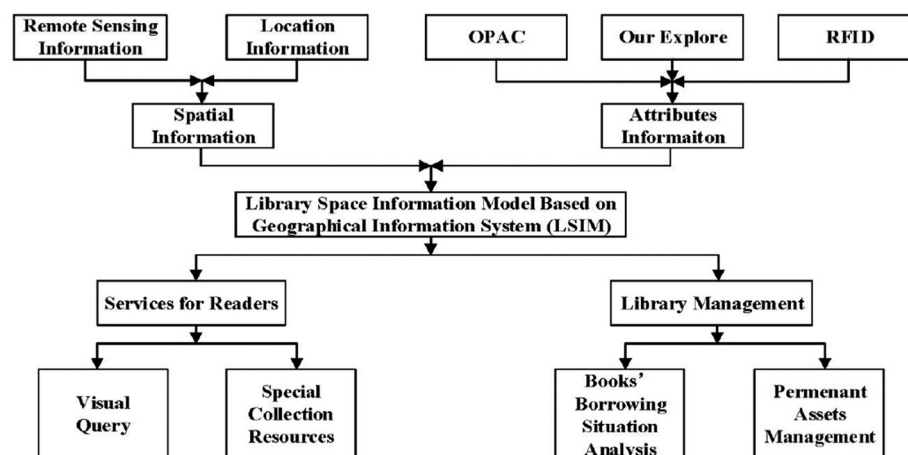
blend of different information like CDs, computer software, DVDs and videotapes. Public libraries also provide internet facilities to their local users. Public libraries sometimes offer outside services like OverDrive, Inc or OCLC NetLibrary. It also provides services of e-books, audiobooks, videos, music, etc. It provides community meeting rooms and services to toddlers and children. Even to some students, it offers storytelling services after school programmes. Public libraries also offer online programmes at home, such as summer reading programmes for children, families and adults. In local areas, public library offers mobile library services. In-person and online programs for homework help, language learning and other community service programs are standard offerings (Hussain, 2020). One of the most popular programs offered in public libraries is summer reading programs and mobile library services as per a regular schedule. It not only entertains adults but also offers services to particular community groups, such as teenagers and children of specific communities other than the national language. The working librarians at public libraries offer reference and research services to the general public. Even people can visit online catalogue and ask queries on their phones. Some public libraries provide social media services to their vast community, sharing ongoing events and displaying fresh

arrivals. Some libraries grant access to digital content by providing them with a login password (Hussain, 2020). Some librarians also offer internet services to their registered members (Abid, 2022). There are few staff in small public libraries, while there may be more than one desk service in large public libraries. In large public libraries, information desks answer online queries on particular topics. A separate reference desk for children guides them to use the library materials. Public libraries also organize training programmes by inviting experts in different fields. It also organizes book discussion programmes for the authors while launching their books. Some public libraries serve the community by offering them various trainings like the maker space programme, technical and vocational training programmes, etc. In short, public libraries are public institutions where people from surrounding communities come together and use these public libraries' resources and services.

Geographical information system and public libraries

The leader of the first industry-scale computer-based GIS, Mr Tomlinson, is known for the word GIS, who coined this word earlier in 1960. He is the first Canadian geographer who introduced GIS as geospatial data, data related to space (Bishop and Mandel, 2010). Many researchers use GIS as a tool, while others consider it a variety of scientific questions, methods and knowledge related to GIS (Longley *et al.*, 2015). The GIS in terms of library services was found initially in the encyclopedia of library and information systems which explained the use of GIS in library services (see Figure 2). The encyclopedia further explained that the use of GIS in library services appeared first in the journal *International Journal of Geographical Information System*, which was changed to the *International Journal of Geographical Science* later in 1996 as we know that GIS is relevant to spatial information, which was derived from the subdiscipline of geographical information science. A journal named *Geological Information System* has assessed the word GIS in library scenarios and it defines GIS as a great tool that can help better public

Figure 2. Library space information model based on GIS



Source: Shen (2018)

library services. It is still not a general service in public libraries. However, a survey was conducted in 115 member libraries of the Association of Research Libraries in Geography away from the technology of GIS and towards the spatial statistics and other analyses emerging from the subdiscipline of geographic information science.

GIS was used to assess the facilities of libraries and their impact on the community. However, GIS is still not a general service in public libraries. Most libraries only provide maps of collection and location services. Association of Research Libraries conducted a survey in 2015 among 115 member libraries; it was found that among 100%, only 54 libraries offer GIS services in their public and academic library services; however, since 2015, its demand has been increasing in library services (Bishop and Mandel, 2010). GIS is an assessment tool in the public library's view. It has been adopted in collection development and community impact for the past few years. Now libraries in large schools interconnect their services through GIS applications.

Advantages of geographical information system in public libraries

The emergence of technologies brought tremendous changes in the information explosion; it has challenged

the librarians to organize this information in a way that can be easily accessed. Information in various formats has become a hectic job for the librarians to organize in this crucial time. GIS provides a framework and technological infrastructure to handle spatial information to make these services more innovative. The GIS can support the librarian's work in R&D, education and provision of access to digital and spatial material in a map to preserve them efficiently:

- GIS can help map library collections and identify the service areas of concerned libraries. It can also be used to survey the library collection.
- Many patrons who come to the library can use the services of GIS by planning library space management. The patron can use this technology by analysing the library space both inside and outside. It can also be used to find new branches opened by a regional public library.
- GIS can also be used for thematic maps and user education. It is said that "A picture speaks more than a thousand words". It can be used to design maps of library floors, shelf maps and digital contents through visual formats.
- GIS can be used to find book suppliers/distributors, solving the delayed delivery of documents; a nearby supplier would save time

for public library transportation expenses.

- The public library can also identify patrons' locations for analysing their demographic characteristics. GIS can serve them better in this regard.
- In today's age of information technology, GIS applications can be used to apply a virtual library network to activities based.

Digital services in public libraries using network-based geographical information system models

GIS can be used for gaps in access to information communication technology. Through this technology, a high level of material can be accessed (Hull, 2003). It can be used to investigate variation in the provision of digital services per the population's demand. It can attract potential customers to public libraries when estimating attendance (Higgs et al., 2013). GIS can potentially increase the use of digital facilities granted by public libraries. It can better help in internet use of the public library to access the digital material. It can also help the users to find locations of public libraries in specific areas. The European Congress on E-inclusion used the services of GIS. They use this technology to transform access to digital Europe in public libraries (Higgs et al., 2013). The society of chief librarians (Higgs et al., 2013) drew the

public's attention to maximize the public library's use and requested a comprehensive strategy to empower these public libraries.

Upon the response, many have believed that attaining the digital inclusion of goals of the public library set by the government can enhance its importance. Many have believed that promoting and supporting digital literacy will facilitate access to computing services, especially for those who cannot visit libraries personally (Higgs *et al.*, 2013). It was also highlighted that more than 70% of public libraries offer accessible internet facilities in their communities. However, the broadband provision in public libraries is another drawback (Mandel *et al.*, 2010). The society of chief librarians in Wales also suggested that the role of public libraries is increasing.

Nevertheless, more programmes like training programmes for new technologies, orientation services and engaging the e-government services in the public libraries will further enhance its role. There is still a lack of GIS technology to reach the region's vast population. It was further suggested that using GIS will bring a positive change in the services of public libraries offered in Wales state (Jaeger *et al.*, 2012, p. 271).

Use of geographical information system in locating of library material

GIS can help in locating library material through the help of maps and catalogues integrated by experts with this application. It gives a mapping search for the users whatever they search. Online Public Access Catalogue does not have much capacity to handle all records per user's needs. Computer experts may expand it, but it would be more expensive and complex for low-budget libraries. Libraries with less budget can use the services of GIS applications for better and smooth functions of library materials. It can work better than other software for manipulating and presenting maps. If libraries convert their data to spatial databases, it can work dynamically and give good result upon completion of a spatial analysis of data. GIS's scalability can also ensure an internet connection in a public library setup.

Usage of geographical information system in collection development

If you have a user's demographic profile, GIS helps you identify potential growth areas in your library's collection development. You can also identify the user's demands by using this application because it tells you who uses what sort of information and how we offer more services to maximize our impact on communities who use our collection. It can display the collection through dots on a map representing a unique library transaction cluster. Due to huge rush in the library, sometime library staff do not watch that what is going on, so this application give them support to check everything carefully. It can also be used to identify the reading needs of our users and their growth areas. GIS can also give us a direction to identify the empirical, quantitative and convincing questions requested by patrons to maximize the library services.

Challenges faced by library staff about the usage of geographical information system applications

- GIS is a resource-intensive applications that required planning strategy, hardware, software and long-term financial investment. Librarians working in public libraries should know these challenges in mind before deploying this technology.
- There are some free software used by GIS, such as FOSS GIS. Such software have limitations factors that are crucial for libraries with less budget. Librarians should consult with expert before stepping into GIS software. Costly software required high budget, and such factors may hinder the implementation of GIS in library services.
- Lack of awareness among library practitioners is yet another challenge. Librarians should consult GIS expert before deploying this technology in their respective libraries. Non-availability of GIS expert might hamper the library services in public library scenario.
- This technology has not been fully recognized by library practitioners,

and it is an imperative to begin GIS literacy projects with experts in the field before implementing it in library services.

- Lack of trainings, workshops and short-term course regarding GIS application is yet another challenge for the librarians.

Conclusion

GIS has become a potential tool for multiple businesses. The word GIS was coined by Roger F. Tomlinson, earlier in 1960. He was an expert geographer based in Canada. The primary purpose of GIS is to combines multiple data sets in any discipline using geographical references. It has become a versatile research tool in multiple fields that deals with the data set's contextualization based on its relationship to its physical environment. Public libraries are designed to serve the local community with rich information resources; however, people do not find time to visit libraries physically. In such a situation, it is crucial to use these resources. GIS applications are designed and adopted by different libraries worldwide to show the maps of collections, support research activities and provide adequate access to spatial information housed in public libraries. The finding of this study would help to understand the essential functions of GIS and its core value in public library scenarios. The study also highlights the prospects and challenges of GIS in the public library and its solution for better understanding; however, empirical studies of experts in both GIS and Librarianship field would further widen the scope of this subject for future use.

Recommendation

- GIS is a valuable application that can be used to collect, store and analyse by the public libraries. Library practitioners who work in the public library should attract more users by using this application.
- The library with less budget should adopt inexpensive mapping

software for visualizing the library data and show them online on map.

- Public libraries are mostly used by local community. People living in remote areas cannot use the library services offered by public libraries. GIS can help them through distance learning programme.
- Public libraries should also use the map for targeting the market effort and funding for future projects.
- GIS experts may be engaged to train the library staff to know more about this application. It is the responsibility of public libraries to engage GIS expert in their public library services.
- Trainings, workshops and short-term course regarding GIS should fully be organized among librarians to get more awareness about this application.

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FURTHER READING

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ABOUT THE AUTHOR

Abid Hussain is a veteran librarian based in Islamabad, Pakistan. Currently, he is

working as Deputy Director Library at the Institute of Strategic Studies Islamabad (ISSI). His research interests include library leadership, Digital Library services, Web-based technology, information literacy, bibliometric and information services. Before his current position, he was serving as a Digital Library in charge at National Defence University Islamabad (April 2009–April 2017), and Assistant Librarian at the Air University Islamabad (May 2005–September 2007). He has contributed 27 research papers to national and international reputed journals, whereas three of his articles are in pipeline. He has also published more than 70 columns, essays and opinion articles in various English dailies, magazines and blogs pertaining to library issues in Pakistan and abroad. He is regularly writing for five English dailies such as *Pakistan Observer*, *Daily Times*, *Pakistan Today*, *The News* and *The Nation*. His whole contributions can be viewed at https://scholar.google.com/citations?view_op=list_works&hl=en&hl=en&user=GdVB77sAAAAJ. He contributes regular articles for the quarterly newsletter of International Association of School Libraries (IASL). He has designed, implemented, coordinated and assessed the library instruction program, and trained fellow librarian master's instructional theory and methods. He is an MPhil Scholar at the Department of Library and Information Science, University of Peshawar, in batch 2021–2022 and earned his master's degree in Library and Information Sciences from the same university in 2006; for dealing with social science scholars, he had completed his master's degree in Political Science in 2011 from the University of Peshawar; for instruction of library customers, he has attained a Bachelor of Education (B. Ed) degree from the Sarhad University Peshawar in 2016. He is an active member of American Library Association (ALA), Chinese American Librarians Association (CALA), International Association of School Librarianship (IASL), International Federation of Library Associations and Institutions (IFLA), Association of College & Research Libraries (ACRL), Canadian Library Association (CLA),

Association for Information Science and Technology (ASIS&T), Pakistan Library Association (PLA), etc. He is raising library issues through TV programmes, radio talk shows and other social blogs and keenly raises Pakistan's role in library scenario at national and international conferences, webinars and seminars. During his career, he has completed many projects in digitizing various libraries in Pakistan. His few praiseworthy projects are as follows:

(1) Islamabad Policy Research Institute, Islamabad, Pakistan (IPRI).

Website: (www.readerslounge.org/);

(2) Institute of Strategic Studies Islamabad, Pakistan.

Website: (<http://issilibrary.org.pk/>);

(3) National Defence University Library Islamabad-based.

Website: (<http://111.68.99.107/libmax/opac/index.aspx>);

(4) Ghazi Library Command & Staff College Quetta.

Website: (<https://cscquetta.gov.pk/library/>);

(5) Islamabad Business School Library, Pakistan (IBS).

Website: (<https://ibs.edu.pk/library/>)

Abid Hussain (abidmardan@gmail.com) is based at Library, Institute of Strategic Studies Islamabad, Islamabad, Pakistan.