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## **The changing roles of librarians: Managing emerging technologies in Libraries**

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**Abstract:** This chapter presents an overview of the changing roles of an academic liaison librarian who is also popularly known as liaison librarian or subject librarian or subject specialist. The major activities which are being performed by a liaison librarian have been categorized. Further, the skills and competencies required by a liaison librarian to perform the activities have been summarized.

**Keywords:** Academic libraries; Academic liaison librarians; Liaison librarians; Subject specialists; Emerging technologies

### **Introduction**

The rapid development in information technology over the years has resulted in the proliferation of information resources. The complexity of today's information environment has pressured in expanding the roles of librarians in the higher education system. Further, the rise in the number of students in higher education institutes has compelled the subject librarians to make new economic and administrative frameworks.

Libraries can help the faculty members and researchers in faster information retrieval; increased research productivity; and better information services by conducting topic mining, prediction modeling, altmetrics, social media mining, sentiment analysis, augmented reality application, mobile application, etc. These roles will be further explained in detail under the sub-section "Suggested Role" of academic liaison librarians in this chapter. One of the major responsibilities for a subject or liaison librarian is to provide research support to the faculty members that include developing collections to meet their needs and providing research consultations and other relevant services. To successfully provide research support, a subject librarian is required to understand the research output and interest of its liaison department and each faculty member's research interest. Library's support in research is indispensable and has been agreed upon by previous studies like Klain Gabbay and Shoham (2017); Brown and Tucker (2013). "From the institutional perspective, it can be argued that research productivity is principally an economic issue. Greater productivity characteristically equates to successful external funding; it also weighs significantly in terms of educational rankings, which, in turn, have an impact on student enrolment and faculty member recruitment.

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Research productivity can also be viewed in part to be an economic issue for individual faculty members because it correlates directly with professional advancement and job security” (Hollister and Schroeder 2015). Rawls (2015) also confirmed the positive correlation between library investment and faculty research productivity. “Traditionally, librarians rely on the department’s website and personal interactions with a faculty member to gain this information. However, the department website sometimes has only brief information on faculty research and is not consistently updated. Also, librarians and faculty members have many job responsibilities, so time for personal interactions is limited. Some librarians take a more proactive approach to understand faculty research by conducting citation analysis for specific disciplines for the faculty they liaise with” (Gao 2017). Therefore, subject and liaison librarians or research librarians could help to increase the research productivity of their own department and faculty members by providing consultations, products, and services in an efficient and effective manner.

## **Subject Librarians**

*Academic liaison librarians or liaison librarians or subject librarians or subject specialists* are the librarians who are assigned to a particular department in an educational institute or university or college with a particular educational background or experience. They are the communication bridge between the library system and their respective departments in order to provide support for teaching and research. They perform various tasks including taking instruction sessions, providing research support to the faculty and students, and helping in the collection development for their respective departments. Liaison librarians usually specialize in specific subject areas or are assigned to specific client groups in order to capitalize on their specialized knowledge. This enables them to tailor library services according to their users’ needs. The academic liaison librarians help the students in particular to develop information literacy skills that are related to finding, evaluating and using scholarly information related to their specialized course in order to complete their assignments or conducting research. They assist students in searching and evaluating scholarly literature and research materials for writing essays, reports, literature reviews, dissertations or theses. Academic liaison librarians usually work alongside the academic staff to foster the development of student research skills and support the practice of academic research at all levels in accordance with a university library’s research skill support strategy.

## **Traditional Roles**

The traditional responsibilities of a liaison librarian include:

- i) collection, development, and maintenance of the resources related to the concerned subject field in the library;

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- ii) delivering subject-oriented library instruction to the students;
- iii) promoting and delivering reference and information services to all library patrons;
- iv) developing and fostering direct and effective communication between the library and the academic department on all library services;
- v) providing good public relations inside and outside the library;
- vi) providing detailed collection development policies that define parameters of resources, services, and describing the mechanisms for amending the policies;
- vii) developing a collection development policy for staff and users;
- viii) performing cataloging and classification of the resources;
- ix) conducting user education including library induction;
- x) managing the budget;
- xi) giving information skills training to the patrons;
- xii) providing inquiry support to the patrons;
- xiii) production of guides, Web pages, etc.; and
- xiv) publicize and market their resources and library.

### **Current Roles**

The major role of a subject librarian differs from institution to institution. Nevertheless, in the collaborative age, in addition to the traditional roles as mentioned above is to ensure that:

- i) teaching and learning is supported and extended by leading the design, delivery, and evaluation of programs supporting information literacy and research skills development;
- ii) information literacy programs on popular topics are developed and training workshops are conducted from time to time;
- iii) researchers gain maximum benefit from the services;
- iv) library services are developed based on a sound understanding of the user experience;
- v) information resources are evaluated and selected to support users' needs for teaching, learning, and research;
- vi) advice on search techniques and strategies are provided;
- vii) resources that are in the course or research available and accessible;
- viii) strategies and resources for promoting academic integrity and effective citation practices;
- ix) offer guidance on copyright and fair use;
- x) provide assistance in developing permanent links to resources on content management systems used by the faculty;
- xi) in-depth research assistance is provided to students;

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- xii) library guides to help students relevant information of a topic is created and customized;
- xiii) guidance in the use of citation management tools (eg. RefWorks, Mendeley, Zotero, EndNote, etc.) is provided;
- xiv) advocating the subject collection;
- xv) unethical practices with regard to plagiarism are avoided in research among the users; and
- xvi) developing online tutorials and other learning materials and methods to boost patrons' research skills and knowledge.

### **Suggested Role**

Some of the new roles which liaison librarians should perform in addition to the traditional and current roles are:

- i) creating new value-added library services using *big data technologies* by analysing the digital data computationally to reveal patterns, trends, and associations especially relating to human behavior and interactions, for instance, (1) by conducting bibliomining of the users' data from the library management system (LMS) to a) discover the reading patterns of the users, b) by determining when people use the library more often so that staffing needs can be met adequately, c) to weed-out books, and d) to perform data visualization and much more; (2) by performing text analysis using various tools like ViontTools, RapidMiner, TopicModelingTool, etc.; (3) by visualizing data using infograms, Tableau, Microsoft Power BI, and other visualizing tools; etc.
- ii) providing information literacy courses on research data management to researchers and faculty so that they can manage, organize, curate and preserve their data properly for transparency, re-use, sharing, and reproduction;
- iii) by optimizing the digital/electronic collection of the library to generate better search results by tagging of digital and electronic resources of the library using *topic modeling* (where topic modeling is defined as the process of assigning topics to a corpus of document on the basis of the hidden concept/theme behind them) and to make recommendation for the resources by providing recommendation service to their users on the basis of their search habit of the digital/electronic resources using *topic proportion*. A topic proportion is the percentage probabilities that segregate the resources on the basis of their similarity. Both the techniques are a subset of text analysis technique;
- iv) introducing machine-learning models to process library data in order to provide trained responses that are based on previous interactions, word relationships, and vector analysis;

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- v) using *blockchain technology* to a) build an enhanced metadata systems, b) protect the digital rights of the library data centres, c) connect the network of libraries; d) support community-based collections; e) host digital peer-to-peer sharing; f) facilitate collaboration across universities; g) give badges for skill training; and h) manage, curate and preserve digital data;
- vi) using data mining principles, natural language processing, and artificial intelligence to search library databases semantically to compare the text resources to filter out the items that better align with researcher's needs;
- vii) using an expert system to substitute reference librarian;
- viii) to convert AACR2 into the highly structured rules and automate cataloging through expert systems;
- ix) using an expert system for classification, cataloging, indexing, acquisition, etc. instead of the traditional methods;
- x) constructing *topic maps* to make better relationships among the co-authors, citations, geo-location, dates, named entities, subject classification, institution affiliations, publishers and historical circulation information, etc. Topic maps are the common reference models which can be used to apply common techniques such as cataloging, thesaurus, index, etc. to provide an approach which addresses the advanced techniques of linking; semantic web and ontology;
- xi) using *Internet of Things (IoT)* a) to provide virtual tours for patron's orientation; b) to maintain temperature, humidity and control dust in the stack and reading rooms; c) to locate books on the shelves; d) to help the libraries to control the lighting, security, and fire-fighting systems; e) to monitor airflow and ventilation; f) to provide real-time messaging services; and g) to perform book monitoring, registering, inventory control, self-checking in and out, etc.
- xii) using *drones* to deliver books or other printed materials to the users within the campus or creating virtual tours for the library;
- xiii) conducting sentiment analysis of their library's handling account on facebook, twitter, instagram, etc. to determine the various needs and satisfaction or dissatisfaction level of their users with their products and services;
- xiv) using social media to market their products and services;
- xv) embedding QR codes for their collections and services on their websites for application-based library services;
- xvi) convert traditional, automated, electronic, and web-based library services into mobile-based library services;
- xvii) using augmented reality tools as a learning tool in the academic libraries where images from printed resources can be overlaid with digital data in order to provide additional illustration and reflection for a deeper understanding of the context through other perspectives. It transforms printed resources by overlaying helpful supplementing information on the related concepts with digital information in the form of additional hyperlinks, websites, research articles snippets, images, videos, animations, geo-located metadata, 3D enhancements, etc. Thus, liaison librarians

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- can develop a special collection of books and maps from the library's collection and convert it into augmented books and maps using augmented reality software. These augmented books and maps will contain added information in the form of hyperlinks; websites; research articles; images; videos; etc. are generally visualized using the augmented reality application from mobile;
- xviii) using *robotics* a) to build on-demand and batch scanning system that allows real-time browsing of printed material through a web interface for manuscripts, rare-book or other archival collections; b) developing and maintaining chatbots/digital assistants/virtual agents/intelligent agents which simulate an intelligent conversation through text or speech to answer reference queries, thus having an automated customer service representatives; and c) to introduce robots with arms having some degree of freedom will be able to locate books and place them at desired shelves or assist a user to find the location of the book by scanning the RFID tags;
  - xix) introducing an online discovery system that is based on *artificial intelligence* technology and helping the users to discover resources that would have been otherwise inaccessible. It gives Google-like experience by replicating the multi-searching format;
  - xx) using *artificial intelligence* technology to identify rarely used resources and then efficiently moving those resources to the locations where they are most likely to be used;
  - xxi) conducting altmetric analysis of their faculty's and students' publications to determine the research impact of the institution's through social media;
  - xxii) collaborating with the faculty members and researchers in their research projects;
  - xxiii) applying for research grants and research proposals; and
  - xxiv) to have a *library makerspace* area that give users and faculty members the opportunity to create intellectual and physical materials using resources such as *3-D printers* which help the faculty or students to visualize their research problems for instance, the history students can print out historical artifacts to examine; graphic design students can print out 3D versions of their artwork; geography students can print out topography, demographic, or population maps; chemistry students can print out 3D models of molecules; biology students can print out cells, viruses, organs, and other biological artifacts; math students can print out 3D models of problems to solve and so on; *audio and video capturing tools; editing tools; traditional arts and crafts supplies; board games*. It can be used to develop a certain skill like cooking, sewing, yoga, drawing, sketching, pottery, and gardening.

## Competencies and Skills Required

In order to perform the said roles, a subject librarian needs to have the following skills and competencies;

- i) theoretical knowledge related to the specific department they are working with;

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- ii) theoretical knowledge of the trending research topics in the field related to the specific department they are working with;
- iii) knowledge of copyright, IPR, fair use, and other related topics;
- iv) knowledge of implementing data mining, artificial intelligence, blockchain, internet of things, expert system, and other emerging ICT techniques and tools in their library and thus, introducing new cutting-edge services to the users;
- v) interpersonal and communication skills;
- vi) management skills;
- vii) teaching skills;
- viii) knowledge of scholarly communication and research data services; and
- ix) attending and actively participating in professional development events to keep themselves abreast of the recent technological changes.

## **Conclusion**

The role of a subject librarian has changed drastically over a period of time. Noh (2015) described that Library 4.0 includes not only software-based approaches but also technological environment development such as makerspace, Google Glass, context-aware technology, digitalization of contents, big data, cloud computing, and augmented reality. It consists of features such as intelligence-based, massive data, augmented reality, context-aware, cutting-edge displays, and infinite creative space. Thus, to be compatible in today's Library 4.0 environment, a Librarian 4.0 has to develop skills in order to meet the needs of today's patrons by performing not only the traditional activities but additional newly emerging cutting-edge technologies.

The role of a subject librarian is dynamic, broad, and intensive in nature. The emerging role of liaison librarians need more thinking about the extent of their role and sustainability in the coming years by contemplating questions such as what are the new trends that liaison librarians have to keep themselves abreast with?; what traditional activities should be discarded?; what new skills are to be learned by the liaison librarians to keep the users engage?; etc. then only they can keep up with the constantly changing digital environment and meet the expectations of their patrons.

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