Chapter 3

Information Visualization Meets Libraries

The Landscape Transformation of Library Data

The White House's Big Data initiatives and policies that were launched in 2012 are responsible for some of the biggest changes in regard to data and libraries in the past several years.[1] This change in the policy landscape has placed a greater emphasis on public access to the results of research funded by the federal government. For example, National Institutes of Health (NIH) policy requires full text of research written as a result of NIH funding to be deposited in PubMed Central within twelve months of publication.[2] A similar momentum to share data has also emerged in academic libraries. For example, Harvard Library made the information on more than twelve million books, videos, audio recordings, images, manuscripts, maps, and more from its seventy-three libraries public. According to David Weinberger, former co-director of the Harvard Library Innovation Lab, "This is Big Data for books. There might be 100 different attributes for a single object."[3] With such an abundance of information at people's disposal, it is now more feasible to create informative visualizations to help analyze Big Data and gain vital insights, such as creating visual timelines that show when publications became broadly cited or maps that show locations of different incidents. Harvard Library's action pioneers an effort that will hopefully encourage other libraries to do the same thing and begin allowing public access to the metadata on their volumes. This has the potential to be the start of a large and unique repository of intellectual information. As a result, data can continue to grow and expand, and information visualization is one of the emerging technologies that can enable a better analysis and interpretation of Big Data.

One other movement that has taken place is that, through the emergence of new technologies that help harness data, various businesses are also increasingly using data visualization for the analysis and processing of large amounts of data. While exciting, this development has raised a new question: What does information visualization mean to libraries? The answer is quite simple. Information visualization provides libraries an opportunity to determine how they can best deliver relevant content to their users through its implementation. The main importance of information visualization from a library's perspective is how it allows the library to leverage all its data in such a way that the data best serves the needs of its patrons or users.[4]

It is not just the patrons who will benefit from the implementation of information visualization in libraries; librarians will also reap benefits. For example, Sarah Murphy of Ohio State University wrote a highly comprehensive and compelling article on what information visualization means to libraries. In this article, Murphy stated that information visualization is important for librarians, especially those tasked with assessment, marketing, and other tasks that require seeing and understanding data. With the help of information visualization, librarians can leverage large amounts of data that were once impossible to efficiently access and manage. Murphy added that with the help of information visualization, librarians can craft beautiful yet informative depictions of data that can help them examine everything from the depth of their collections on a particular topic to the use of their e-resources.[5]

In Carrie O'Maley Voliva's article discussing the importance of information visualization to libraries, she states that information visualization is as

beneficial for the staff of libraries as it is for their patrons.[6] Voliva adds that information visualization not only makes data more accessible to everyone who works at the library, but it also helps create transparency across the organization. This is because everyone in the library is able to become a part of decision-making processes.

The Driving Forces

A lot of researchers have identified different driving forces for libraries to assist them in the implementation of information visualization strategies. The changing nature of the library collection, in conjunction with the rapid changes in technology, is one of the major driving forces that necessitates information visualization in libraries. For example, Rick Anderson predicts that research libraries are going to begin operating in an environment marked with less funding and more competition.[7] Anderson adds that in the future, libraries will also have a lot of expanded options that will help them provide access to high-quality resources. He also notes that in order to deal with this changing nature of the library collection, libraries will have to rethink the ways they build collections.

The driving force that necessitates information visualization in libraries can be best explained in the words of Jannette Finch and Angela Flenner. In discussing the example noted in their study, they state that "the library collection of today is affected by many factors, such as demand-driven acquisitions, access, streaming media, interdisciplinary coursework, ordering enthusiasm, new areas of study, political pressures, vendor changes, and the individual faculty member following a focused line of research. If libraries do not allocate based on data, then there could be subjective distribution of funds, affecting the perception of fairness and damaging the library's reputation on campus."[8] This is an important consideration that must be addressed in today's world.

Another one of the major driving forces behind implementing information visualization in libraries is its ability to increase the library's value to its end users. By delivering information to users in an easy and timely manner, libraries can enhance the way users perceive the library. In Martha Kyrillidou's work, she indicates that the main aim of research libraries goes beyond just collecting, analyzing, and reporting data. It also includes improving their services.[9] According to Kyrillidou, the use of information visualization in libraries not only helps in gathering and evaluating data, but also helps libraries serve their end users better at low administration costs.

Another major driving force that necessitates the use of information visualization in libraries is the increase in the number of e-resources. An additional insight in Kyrillidou's article is that libraries spend a large amount of money to purchase licensed e-resources.[10] Kyrillidou indicates that with the use of information visualization, libraries can easily reduce the cost of purchasing e-resources. The example she offers is how information visualization helps libraries identify their users' behaviors about the use of their e-resources while also helping them track the usage of e-resources at a deeper level. Information visualization can help assess what motivates users to access particular e-resources. This feature of information visualization, according to Kyrillidou, can help libraries cut the cost of purchasing e-resources as they help library staff make informed resource renewal decisions. This is important especially because, as Rick Anderson pointed out, considering the changing nature of the digital collections, there is no need for libraries to purchase online resources before the need arises, as they can easily purchase online resources at the point of use.[11]

An additional bit of insight comes from an article by Mitchell Dunkley of De Montfort University, where he states that information visualization saves a lot of library staff time, especially content delivery staff members who are often assigned the duty of identifying and analyzing user behavior.[12] In his example, Dunkley adds that information visualization not only helps the content delivery staff to make better resource renewal decisions, but it also eliminates the need to manually access and download journal usage reports from the sites of individual publishers. This process thereby saves time for the staff members who are responsible for content delivery, which is beneficial because they can use their time for other productive work.

Apart from these reasons, other factors related to research, such as the need to make all data related to research open, shareable, and reusable, has led to the need for information visualization to become mandatory for libraries to implement. For example, Annarita Barbaro's work states that researchers in Northwestern Mutual's Advanced Planning Library face several challenges in developing data policies.[13] These challenges include the collection and arrangement of information in a way that will help researchers easily retrieve said information and use it in the future as necessary. Barbaro also notes that these data policies affect the core roles of librarians and that librarians have all the necessary competencies to support researchers in every stage of research. In other words, Barbaro states that there is a great need for libraries to develop services that can help researchers create, collect, manipulate, store, and preserve data sets. Another point that Barbaro adds is that with the help of information visualization, libraries can bridge the gap between research needs and library services by helping researchers "clean" data for analytic use. One other notable observation from Barbaro is that

providing researchers open access to information also provides an opportunity for libraries to play an integral role in the research process.[14]

Trends and Practices

The major trends and directions involving the intersection of information visualization and libraries are mainly focused on ensuring that libraries and librarians understand the emergent needs of information visualization. Libraries must focus their efforts on practical applications of information visualization that will help them gain valuable insights to make important decisions, such as selecting resources to renew. Because of these results, a clear path has been paved that will allow for stronger and more effective research on how information visualization in libraries can benefit the creation of open educational resources, which are viewed positively by both faculty and students, as these resources are contributors to student success. This contribution is mainly due to the creation of open education resources, which are able to bring together huge scholarly records from different subject areas.

Aside from information visualization benefiting libraries through the creation of open education resources, current trends also indicate the need to find different information visualization techniques that can provide best results to libraries and their end users. For example, Ryan Womack of the State University of New Jersey states that the implementation of information visualization should not be an end in and of itself for libraries.[15] It is important for libraries to compare different information visualizations to develop an understanding of which visualizations provide the best results. Hence, future trends call for experimenting with different information graphics that use different tools and provide different results, which can maximize the benefits offered by data visualization in libraries.

Womack is not alone in his assessment. Angela Zoss of Duke University agrees and states that as information visualization becomes increasingly embedded in library assessment and outreach, it is important to consider the perspectives of audience and design visualizations that are easy to interpret.[16] Zoss adds that even though there is lot of research conducted on information visualization, research on what type of information visualization techniques can help visually communicate archival context and content in a better manner is lacking. This is why she states that there is a need to conduct more studies on measuring the utility of the existing information visualization techniques, especially those that are used to communicate archival context and content from the perspective of library users.

Apart from benefiting libraries and researchers, there is a stream of trends and directions investigating how implementing information visualization in libraries can contribute toward student learning. For example, a number of studies in the wider literature of library and information science investigate how information visualization intersects information literacy. In addition to considering the fact that an increasingly higher number of students are now exposed to data and information science, there is a quest in the literature on how information visualization should be integrated into general education. There is a belief that the intersection of information visualization and libraries could help expose students to fundamentals of information visualization in general and information literacy in particular.[17] It has been acknowledged that more research is needed on how libraries and librarians can contribute toward development of the information literacy standards among students. Similarly, in a study by Hattwig and colleagues, they indicate that in today's world, where students live in a visually rich environment, it is important for students to develop relevant visual literacy skills.[18] The authors state that libraries can contribute to student learning in the area of visual literacy when they incorporate information visualization into learning. The authors further add that since libraries are often involved in teaching students about the knowledge production process, the field of visual literacy presents an opportunity for libraries to expand their role as partners in student learning. This conclusion is shared by Lauren Magnuson in her book: she agrees and states that "as libraries become more advanced creators of data visualizations, they can play a role in educating their users to become data literate consumers and producers of visualizations."[19]

Another substantial trend stems from a library staff's ability to develop core skills in information visualization. For example, as Womack points out, considering the growth in the quantity of data and technologies supporting that data, library management should consider investing in the development of core skills that will help their staff make the best use of information visualization.[20] In considering the benefits that information visualization provides with regard to presenting, interpreting, and using information, Womack stresses the importance of libraries leading the data information literacy process. In fact, Womack notes that since more and more students are now exposed to information visualization, students should be provided with training from library staff that will equip them to better understand not just information visualization but also the world around them. In order to achieve this change, Womack notes that librarians and educators should equip themselves with accurate information visualization techniques so that they can successfully instruct students. This development has

created an urgent need to conduct research on how libraries can enhance staff knowledge with regard to implementing and using information visualization.

Conclusion

It is an inevitable trend on the rise that libraries are going to have to create a culture in which staff is trained in information visualization as a benefit to the library as an entity, its staff, and its end users. Not only will this initiative provide staff more time to work on other projects of importance, but it will also enable staff to work with students more effectively, in both an instructional and informative manner. In addition, the purchasing of e-resources allows for greater flexibility and the ability to quickly meet research demands and access information from other institutions, which may be imperative to the end user's work. By having instant access to information visualization techniques, students are also able to benefit from a stronger learning experience through their access to the latest trends, research, and data.

Notes

1. "Obama Administration Unveils 'Big Data' Initiative: Announces $200 Million in New R&D Investments," news release, Office of Science and Technology Policy, Executive Office of the President, March 29, 2012, https://obamawhitehouse.archives.gov/the-press-office/2015/11/19/release-obama-administration-unveils-big-data-initiative-announces-200.
2. "NIH Public Access Policy," US Department of Health and Human Services, accessed October 24, 2016, https://publicaccess.nih.gov.
3. David Weinberger, quoted in Quentin Hardy, "Harvard Releases Big Data for Books," *Bits* (blog), *New York Times*, April 24, 2012, http://bits.blogs.nytimes.com/2012/04/24/harvard-releases-big-data-for-books/?_r=1.
4. Carrie O'Maley Voliva, "Data Visualization for Public Libraries," Public Libraries Online, April 20, 2015, http://publiclibrariesonline.org/2015/04/data-visualization-for-public-libraries.
5. Sarah Anne Murphy, "How Data Visualization Supports Academic Library Assessment: Three Examples from the Ohio State University Libraries Using Tableau," *College and Research Libraries* 76, no. 9 (2015): 482–86.
6. Voliva, "Data Visualization."
7. Rick Anderson, "Collections 2021: The Future of the Library Collection Is Not a Collection," *Serials* 24, no. 3 (2011): 211–15.
8. Jannette L. Finch and Angela R. Flenner, "Using Data Visualization to Examine an Academic Library Collection," *College and Research Libraries*, forthcoming.
9. Martha Kyrillidou, "Business Intelligence and Data Visualization with Tableau in Research Libraries," *Research Library Issues*, no. 288 (2016): 1–4.
10. Ibid.
11. Anderson, "Collections 2021."
12. Mitchell Dunkley, "Library E-Resources Usage and Cost Analysis—Creating a Template Spreadsheet," *Mitchley's DMU Blog*, December 3, 2014, https://mitchley.our.dmu.ac.uk/2014/12/03/library-e-resource-usage-cost-analysis-creating-a-template-spreadsheet.
13. Annarita Barbaro, "On the Importance of Being a Data-Savvy Librarian," *Journal of the European Association for Health Information and Libraries* 12, no. 1 (2016): 24–27.
14. Ibid.
15. Ryan Womack, "Data Visualization and Information Literacy," *IASSIST Quarterly* 38, no. 1 (2014): 12–17.
16. Angela M. Zoss, "Designing Public Visualizations of Library Data," in *Data Visualization: A Guide to Visual Storytelling for Libraries*, ed. Lauren Magnuson (Summit, PA: Rowman & Littlefield, 2016).
17. Womack, "Data Visualization and Information Literacy."
18. Denise Hattwig, Kaila Bussert, Ann Medaille, and Joanna Burgess, "Visual Literacy Standards in Higher Education: New Opportunities for Libraries and Student Learning," *portal: Libraries and the Academy* 13, no. 1 (2013): 61–89.
19. Lauren Magnuson, Preface," in *Data Visualization: A Guide to Visual Storytelling for Libraries,* ed. Lauren Magnuson (Summit, PA: Rowman & Littlefield, 2016), xiii
20. Womack, "Data Visualization and Information Literacy."