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Article

Application of Information Visualization in Academic Libraries: An Overview

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A B S T R A C T

Academic Libraries have numerous sections and they generates huge amount of data and information while providing number of products and services to its users. The generated data or information will be helpful in taking decisions and improveing the existing services. Proper understand and represent the data visualization is essential. The rapid growth of technology has given lot of software tools and techniques for visualizing the information. The visualization is essential for presenting abstract data or information in innovative and creative way. To implement the visualization, its necessary to know what are the possible areas where libraries can easily implement visualizations. This paper presents an overview of the possible areas where libraries can easily and effectively implement visualisation.

Keywords: Information Visualization, Data Visualization, Academic Libraries

Introduction

With the growing amount and accessibility of data and information, visualization is becoming increasingly important. Libraries have been providing lot of services and day today work, library professionals have been handling lot of data and information. The information visualization is the method of consolidating data into one collective, illustrative graphic. Traditionally, data or information visualization has been used for quantitative work, but ways to represent qualitative work have been shown to be equally powerful (Wong, 2013). The main goal of the data visualization is to communicate information clearly and effectively through graphical methods (wikipedia).

Information visualization is a general term that describes any effort to help people understand the significance of data by placing it in a visual context. Patterns, trends and correlations that might go undetected in text-based data can be exposed and recognized easier with data visualization software (Rouse, 2018). The data visualization excels in capturing a viewer's attention and holding it through storytelling. It addresses a complex problem that could be easily looked over and simplifies it using design. Naturally, a new market for business has emerged (Wong, 2013). The data visualization can help with the analysis of the information and present it in a way that allows viewers to discover patterns that might otherwise be hard to uncover. Large amounts of data are hard to wade through, but data visualization can make that data easily understandable (Visually, 2018).

Background

Information visualization is not a new concept, but the ever increasing amounts of information and advancements in technology are beginning to establish its use also in everyday practices. The possibility to present overviews of large data sets on the one hand and to interactively explore and discover on the other, offer interesting potential also

for the library community (Merčun, Žumer, 2014). The term information visualization is easily associated with thoughts of making graphics and images.

The views of information and visualization bring up two important aspects to consider: (1) information visualization is used to discover new insights and knowledge from abstract data through graphical means and (2) information visualization can be considered a representation of data that amplifies cognition. The information visualization plays a major role in enhancing communication, understanding and discovering the data.

Information visualization is applied in numerous areas covering every academics, corporates and industries, where understanding the data is very crucial. Some of the prominent areas are economical/ financial analysis, representation of large hierarchies, medical, engineering and physics. Interest in visualization for medical applications has a long tradition in the field of medical imaging. Medical imaging is more concentrated on its problems such as image acquisition and the processing needed to visualize the acquired images (Chittaro, 2001).

Information Visualization in Academic Libraries

Libraries have been generating a huge amount of raw data in the modern environment, such raw data have significate impact over the academic library to present the library data or information in a proper way. Every raw data can be valuable when it is understood and present in a proper way. Information visualization is essential techniques used for presentation of academic library data or information properly. Information visualization can use in day to day library functionalities to extend the library impact through the visualizing their library data. Library collection, expenditure, usage of library services and resources are the major areas for implementation of information visualization in the academic library.

Academic libraries have been facilitating lot of resources and providing various services thereby generating lot of data such as, the usage of electronic resources, volume of library transactions, usage of computers, visitor information, group study rooms and web-based applications etc. These may be visualized in a variety of ways. The usage data can be analyzed for assessment purposes, to identify previously unrecognized patterns of use that can lead to new and improved library services. It can also used for budget optimization by resource allocation rationalization by creating various sets of visualized content across the data sources within the Library.

Areas of Information Visualization in Academic Libraries

Academic Libraries have various functional division namely, acquisitions, circulation, serial control, technical section, user assistance, digital library, inter-library loan and document delivery services etc. Each section have been generating enormous amount of data in day to day work. For such data or information, visualization can be applied for presenting individual library sections data in graphical way. The major data of an academic library involves the library collection, electronic resources, purchase and acquisition related data and significant usage of library resources as well user stratification about library services offered.

- **Library Administration and Budget:** Library expenditure on various library section, budget analysis, budget proposal
- **Acquisition Section:** New arrivals, books on approval, resources added to the collection in particular period, total number of collection including books and non-book materials
- **Circulation:** Issue, Return, Renewals, Most circulated books, Less circulated books, never issued books, Wilkins of the library and User Feedback, Reference Queries
- **Usage of E-resources and Databases:** Huge amount of data generated in the library usage of databases e-resources, the usage may generate in various frequency that supports the individual databases
- **Library Services:** Academic libraries offered the many library services to satisfy the users' needs some of them are Inter Library Loan, Document Delivery Service, Library Networks
- **Website and other online services:** Website visitor information, Institution, Faculty and Students Publications, Institutional Respository

Importance of Information Visualization in Academic Libraries

Data visualization often said that data is the new world currency, the web is the exchange bureau through which it's traded (Suda, Brian, Hampton-Smith, 2017). With the growing amount and accessibility of data and information, information visualization is becoming increasingly important.

- Flexibility in handling the library data
- Clarity: It is so easy to understand the graph compare to numbers. People can easily understand at a first sight
- Saves time: Since a "picture is worth a million words", using data visualisation helps the audience quickly absorb and interpret the presented data. As a result, data visualisation enables to present a considerably larger amount of data in comparison to the textual format, which often requires repetition in order to help the audience understand the information (Kharb, 2017)
- Less confusion: It is not difficult to get confused when dealing with lots of numbers as people actually need to memorize them to be able to understand the communicated information. The visualizations

dramatically reduces the confusion as people does not need to process the numbers to be able to see where you are going (Kharb, 2017)

- Aesthetic appeal: Visualizations look better and attract more attention than the textual format. They are also more likely to keep the audience interested in the presentation
- Reduce the cost: From the usage statistics of subscribed electronic resources, librarians can find out which are the resources heavily used and less used, so that they can stop renewing less used resources, it will save the subscription cost

Elements of Successful Data/ Information Visualizations

Successful data/ information visualization has three major elements, these are briefly explained below:

- **It understands the audience:** Before creating visualizations, start with the goal, which is to convey great quantities of information in a format that is easily assimilated by the user or decision makers (Stikeleather, 2013)
- **It sets up a clear framework:** The designer needs to ensure that everyone viewing the visualization is on common ground about what it is representing. In order to do so, the designer needs to set up a clear framework, which involves the semantics and syntax under which the data information is designed to be interpreted (Stikeleather, 2013)

Lines and bars are simple, schematic geometric figures that are an integral component of many kinds of visualizations: lines connect, suggesting a relationship. Bars, on the other hand, contain and separate. In studies, when people have been asked to interpret an unlabeled line or bar graph, people overwhelmingly interpreted lines as trends and bars as discrete relations even when conflicting with the nature of the underlying data (Stikeleather, 2013).

- **It tells a story:** Visualization in its educational or conformational role is really a dynamic form of persuasion. Few forms of communication are as persuasive as a compelling narrative (Stikeleather, 2013)

Storytelling helps the viewer gain insight from the data. Information visualization is a process that transforms data and knowledge into a form that relies on the human visual system to perceive its embedded information. The goal is to enable the viewer to observe, understand and make sense of the information (Stikeleather, 2013).

Visualization designers need to dig into the data in order to gain an understanding of it, also to connect with the visualization's audience. Good designers know not just how to pick the right graph and data range, but how to be a compelling storyteller through the visualization (Stikeleather, 2013).

Tools and Techniques of Data Visualization

As technology continues to grow, it has given many software tools to visualize the data and information to the society. Similarly it also offered many tools and techniques to academic libraries. Some of them are mentioned below:

Tools: Creating charts and infographics can be time-consuming. But the visualization tools can make it easier. One of the best ways to get message across is to use a visualization to quickly draw attention to the key messages, by presenting data visually it's also possible to uncover surprising patterns and observations that wouldn't be apparent from looking at stats alone (Suda, Brian, Hampton-Smith, 2017). Some of the well-known and free tools are: Augl, Bonsai JS, Candela, Canva, Carto, Chart Blocks, Charted, Chartist.js, ColorBrewer, Cube, 3.JS, Data Wrangler, Datawrapper, Dipity, Dygraphs, Envision.js, FusionCharts, Ganttpro, Gliffy, Google Charts, Google Data Studio, Highcharts, Infogram, JavaScript InfoVis Toolkit, jpGraph, jQuery Visualize Plugin, Leaflet, Modest Maps, MyHeatMap, Openheatmap, Plotly, Polymaps, PowerBI, Raw, Silk, Tableau Public, Timeline, Visualize Free, Weave, Zoho Reports.

Techniques: A picture is worth a thousand words, especially when trying to find relationships and understand the data, which could include thousands or even millions of variables. To create meaningful visuals of the data, there are some basic techniques should be considered (SAS Institute Inc., 2017). Some of them are:

- Gather data (intelligently)
- Delegate additional research
- Use great design
- Consider interactivity for widgets
- Quirky is at least as important as correct
- Know who your targets are
- Provide the embed code (with a link)

Conclusion

Technology continues to be helpful for academic libraries and information visualization tools provides a chance for academic libraries to innovate, boost quality, measure success and align services with the priorities. With visualization, libraries can reintroduce themselves as visible, valuable and essential partners in achieving institutional goals (Johnson, 2015). Use of Information visualization will helps academic libraries in taking decision related to growth, development and uplifting the existing services. The acquisition section data will create impact in building and promoting the library collection and identify the gap between various subject areas. The circulation section data will helps to analysis the collection by most used books,

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prolific authors, most borrowed users. And also this data will help to identify the collection which is not used in the library, so that one can promote the unused collection. Visualizing the usage of various subscribed electronic resources, digital library and other web services statistics will create impact by knowing the usage, so that the academic libraries can take this data in renewing the subscribed resources and helps in delivering the web based services. The usage statistics will be helpful in managing the budget of subscribed electronic resources in academic libraries.

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