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User-Centered Library Visualization

Developing a visualization of digital library collections with user-centered and participatory design

Luis Moßburger

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Zu den Preisträger*innen

Auch in diesem Jahr vergibt „Die Kommission für Ausbildung und Berufsbilder des Berufsverbands Information Bibliothek (BIB)“ in Zusammenarbeit mit der Zeitschrift „b.i.t.online“ den b.i.t.online-Innovationspreis für herausragende Abschlussarbeiten bibliothekarischer und bibliothekswissenschaftlicher Ausbildungs- und Studiengänge.

Die Preisträger*innen 2022 sind:

Silvia Kruse

Bilderbücher mit People of Color als Protagonist*innen im Bestand Öffentlicher Bibliotheken

Bachelorarbeit, Hochschule für Angewandte Wissenschaften Hamburg

Luis Moßburger

Analyzing Information Visualization for Digital Libraries with Harvard’s Collections

Masterarbeit, Universität Regensburg / Harvard University

Alexandra Schenk

Storytelling in Jahresberichten: Wie Öffentliche Bibliotheken ihre Jahresberichte mittels Storytelling attraktiver gestalten können

Bachelorarbeit, Hochschule der Medien Stuttgart

Bilderbücher mit People of Color als Protagonist*innen im Bestand Öffentlicher Bibliotheken

Bilderbücher sollten keine Stereotype oder rassistische Zuschreibungen enthalten, die Hauptfiguren sollten nicht nur weiße Kinder sein, kurz: Bilderbücher sollten die Diversität heutiger Gesellschaften widerspiegeln. Doch genau diese Diversität ist auf dem (deutschsprachigen) Bilderbuchmarkt nur bedingt repräsentiert. Das bedeutet eine Herausforderung für den Bestandsaufbau in Öffentlichen Bibliotheken, die sich der auch von der IFLA erhobenen Forderung verpflichtet fühlen, dass alle betreuten Bevölkerungsgruppen, also auch Kinder of Color, repräsentiert sein sollten.

In ihrer Bachelorarbeit diskutiert Silvia Kruse zunächst Rassismus, Alltagsrassismus und dessen Einfluss auf die literarische Verarbeitung in der Kinder- und Jugendliteratur. Darauf aufbauend entwickelt sie eine Checkliste für die Prüfung und Beurteilung von Bilderbüchern auf versteckte rassistische Zuschreibungen. Mit Hilfe dieser überprüft sie, ob repräsentativ ausgewählte Bilderbücher mit People of Color als Protagonist*innen in Großstadtbibliotheken vorhanden sind. Gestützt auf diese Erkenntnisse sowie auf Interviews mit Bibliothekslektorinnen und der Vertreterin eines Bibliotheksdienstleisters gibt sie Handlungsempfehlungen für den Bestandsaufbau.

Sie wirbt dafür, gegebenenfalls durch partielle Umverteilung von Erwerbungsmitteln empfehlenswerte Bilderbücher mit People of Color als Protagonist*innen – auch gestaffelt – anzuschaffen, und zwar unabhängig von der aktuellen medialen Präsenz des Themas Rassismus.

Analyzing Information Visualization for Digital Libraries with Harvard's Collections

Visualisierungen digitaler Bestände als innovativer Bibliotheksservice, die sowohl die Sammlung als Ganzes zeigen als auch den direkten Zugang zu einzelnen Objekten ermöglichen, werden von Bibliotheken bisher kaum angeboten.

In seiner als Gemeinschaftsprojekt der Universität Regensburg und der Harvard University geschriebenen Masterarbeit beleuchtet Luis Moßburger die

Nutzendenperspektive auf Bibliotheksvisualisierungen, sammelt Expertenempfehlungen für solche Projekte und entwickelt einen Prototyp für die Visualisierung digitalisierter Briefsammlungen.

Nach einer ausführlichen Analyse der Anforderungen und Rechercheprozesse der ausgewählten Zielgruppe historisch orientierter Theolog*innen wurde eine Visualisierung digitalisierter Briefe von William Ellery Channing, einem unitarischen Prediger, durchgeführt.

Die minimalistisch und kompakt gestaltete Oberfläche mit Direktzugriff auf die digitalen Dokumente bietet mittels eines Zeitstrahlschiebers chronologische Filteroptionen, ermöglicht eine umfängliche Suche nach Personen und deren Beziehungen zueinander – verknüpft mit Links zu weiteren biografischen Angaben.

Die Visualisierungen überzeugen durch einen hohen, weit über die Möglichkeiten der Erschließung in einem herkömmlichen Bibliothekskatalog mit seinen Metadaten hinausgehenden Mehrwert – übertragbar auf verschiedenste Zielgruppen, auch außerhalb der Geisteswissenschaften.

Storytelling in Jahresberichten

Jahresberichte Öffentlicher Bibliotheken, die regelmäßig für die Bibliotheksträger erstellt werden müssen, informieren über die geleistete Arbeit, die aktuelle Situation und Rahmenbedingungen der Einrichtung. Sie erläutern das Angebotsportfolio der Bibliothek, auch mit Kennzahlen zum physischen und digitalen Bestand und dessen Nutzung. Außerdem berichten sie über Schulungen, Aktivitäten zur Leseförderung oder die Vermittlung von Informationskompetenz. Exemplarische Leistungen und Highlights aus der Veranstaltungsarbeit werden besonders hervorgehoben.

Normalerweise bestehen Jahresberichte aus kurzen Texten, begleitet von diversen Statistiken in Form von Tabellen und Diagrammen.

Dabei bieten Jahresberichte Öffentlicher Bibliotheken über die Zusammenfassung statistischer Kennwerte hinaus die Möglichkeit, die Einrichtung gegen-

über dem Träger und der Öffentlichkeit attraktiver darzustellen, auf Angebote aufmerksam zu machen und die Relevanz deutlich zu machen.

Genau das kann Storytelling leisten, wie sich im Marketing und bei der Unternehmenskommunikation bereits gezeigt hat. Vereinfacht gesagt bedeutet Storytelling, dass Geschichten aus der Bibliothek in die schriftliche Ausarbeitung der Jahresberichte sowie deren Präsentation eingebunden werden, wie Alexandra Schenk in ihrer Bachelorarbeit anhand eines Musterjahresbericht demonstriert.

Karin Holste-Flinspach
Vorsitzende der Kommission für Ausbildung und Berufsbilder des BIB

User-Centered Library Visualization

Developing a visualization of digital library collections with user-centered and participatory design

Luis Moßburger

Preface

The collections libraries hold are subject to continuous change. They grow, shrink, change in scope, content and even in their physical form. They lose valuable items, are extended by undesired pencil scrawl or sticky notes on the pages, fall into oblivion, are re-discovered, endure catastrophes, are restored in painstaking detail work or lose parts of them forever. They not only include sheer information, but document whole lives, relationships, and interconnections, they tell stories. And by doing all of this, by changing steadily, they tell a story of their respective library themselves. One could say, they are as alive as the library managing them and the people who draw knowledge from them.

The question is, how can we communicate such immeasurable value? Quantification of the size of a collection may be impressive, but it fails to express the quality and value of the content inside the collection items. I argue that where conventional tools for the discovery of collections, like catalogs, enable searching and access, visualizations can transport value in a way far beyond sheer availability. They can show interconnections, generate interest, lead to new insights and spark ideas that, ultimately, evolve into (research) questions that may not have been asked without such visual possibilities. The collections we hold and the value of the knowledge in them deserve to be not only available, but explorable.

Admittedly, the idea of visualizing collections like those of libraries and other cultural institutions is not new. In fact, there seems to be a growing interest in cultural collections as data sets for visualizations, among other things because of their before mentioned nature and value. And subsequently, there have been many case studies, prototypes, and tools with this idea at heart in recent years. Nevertheless, most libraries do not provide visual discovery tools as standard services, partially also because evaluations have shown little advantages for their patrons. The goal of the work at hand could, therefore, not be to build yet another tool. Instead, the focus lay on using methodology that allowed a change of perspective. I hope that its results contribute to-

wards the creation of independent and professional visualizations in libraries with participatory approaches that value the opinions and experience of users.

The work at hand is a revised version of my master's thesis, Analyzing Information Visualization for Digital Libraries with Harvard's Collections, handed in in September 2021 at the University of Regensburg. It was supervised both by the Chair of Media Informatics at the University of Regensburg and the User Research Center at Harvard University. For this publication in the series b.i.t.online INNOVATIV, the content was subjected to a revision to better address the target group of this publication series and to hopefully enable librarians to draw from this text for their own work in information visualization for libraries and their collections.

Abstract

With the growing size and changing nature of their digital collections, libraries must actively promote technological shifts to guarantee access to their sources. Information visualization can provide a visual interface to efficiently explore such collections. However, there is too little knowledge on the users' view, and practical guidelines on creating visualizations are missing in libraries. In this thesis, measures were taken to contribute to closing this gap.

Firstly, twelve experts were interviewed, which yielded 112 design recommendations for the implementation of visualizations in libraries and a meta-model for such projects. Secondly, the results of a survey with 242 respondents indicate that the frequency of digital material usage, as well as research topics, influence the openness towards visualizations. Thirdly, utilizing a participatory design approach in the context of an interview study with history-oriented theologians, a prototypical visualization was built with digitized letters from Harvard Library and deemed innovative, efficient, as well as useful in a user experience study.

All results paint the cohesive picture that visualizations can be of high value for library users. The overview on user perspectives, expert recommendations, and the participatory process with history-oriented theologians can serve as a basis and guidance for future visualization projects in libraries.

Abstract (German)

Angesichts der Veränderung digitaler Sammlungen und ihres wachsenden Umfangs müssen Bibliotheken neue Technologien einsetzen, um den Zugang zu ihrem Bestand zu gewährleisten. Informationsvisualisierung kann eine visuelle Möglichkeit zur effizienten Exploration solcher Sammlungen bieten. In den Bibliotheken fehlt es jedoch an Wissen über die Sichtweise von Nutzenden und an praktischen Richtlinien zur Entwicklung von Visualisierungen. Die vorliegende Arbeit soll dazu beitragen, diese Lücke zu schließen.

Erstens konnten aus zwölf Experteninterviews 112 Design-Empfehlungen für die Implementierung von Visualisierungen in Bibliotheken und ein Metamodell für solche Projekte gewonnen werden. Zweitens deutet eine Umfrage mit 242 Teilnehmenden darauf hin, dass die Häufigkeit der Nutzung digitaler Materialien sowie Forschungsthemen das Interesse an Visualisierungen beeinflussen. Drittens wurde mit einem partizipativem Designansatz im Kontext einer Interviewstudie zu Arbeitsweisen von historisch orientierten Theolog*innen eine prototypische Visualisierung mit digitalisierten Briefen aus der Harvard Library entwickelt und in einer Evaluationsstudie als innovativ, effizient und nützlich beurteilt.

Alle Ergebnisse lassen schließen, dass Visualisierungen für Bibliotheksnutzende von hohem Wert sein können. Der Überblick über Nutzerperspektiven, Expertenempfehlungen und der exemplarische Prozess mit historisch orientierten Theolog*innen kann als Grundlage und Beispiel für zukünftige Visualisierungsprojekte in Bibliotheken dienen.

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1 Introduction

Libraries have always been committed to enabling the sharing of knowledge between humans and making the information in their collections available to patrons. The way that libraries manage their collections, however, is steadily changing, and with it its focus, its boundaries, and the value it can and should create for users (Dempsey, Malpas & Lavoie, 2014, 6). One driver of these changes is without doubt the ongoing digital transformation in society and research. It is long clear that to remain relevant service providers, libraries should not only prepare for shifts of that kind but must actively promote it (Hazen, 2011, 120). Apart from licensing digital material like databases or e-books, there are consistent efforts by libraries to digitize and therefore support the preservation of their print material and to provide open access to it online. Depending on the library, this material can be extremely heterogeneous, ranging from pieces of art or manuscripts to photographs, audio recordings, or videos. Harvard Library, one of the largest university libraries in the world, for instance, is investing in digital preservation for two decades already (Smith Rumsey & Whitehead, 2020). The vast resources generated by that are made accessible via the platform "Harvard Digital Collections" (HDC), which as of 2021 contains a diverse set of over six million digitized items[1].

A challenge that comes with this is how to present such collections to show the value and content of the collection as a whole, but also to enable efficient access to individual items. Harvard Library, for example, offers HDC as an efficient discovery tool for this collection that works just like a library catalog. Besides that, "virtual exhibitions", a popular technique among libraries, are used to present content in a more structured way. Such virtual exhibitions are dynamic collections of digital items devoted to specific topics or themes, often with flexible content and complemented by texts and other information (Foo, Theng, Goh & Na, 2009, 3). For Harvard Library, the tool "CURIOSity" helps librarians create exhibitions and presents all of the exhibitions together

1 Available at https://library.harvard.edu/digital-collections (Last retrieved: September 25, 2021)

on one platform[2]. Examples available on CURIOSity include an exhibition on American Currency[3] or the collection of Botanical Illustrations[4].

Discovery tools and virtual exhibitions, however, are only two examples of how to make digital and digitized library material accessible. Another possibility that is also explored for libraries is information visualization (IV), an interactive and visual representation of data (Card, Mackinlay & Shneiderman, 1999, 637). The before mentioned changing nature of library collections together with ever new technologies both act as driving forces for the use of information visualization in libraries. It seems that this technology can increase the library's value to the user by providing information efficiently and in an easily comprehensible way (Chen, 2017, 18). However, information visualization is a complex field at the intersection of design, technology, and information science. Librarianship, therefore, has to first understand information visualization and invest in this technique, which can then lead to its renewed relevancy (Chen, 2017, 25).

This thesis aims to contribute to this understanding of information visualization, as well as its possibilities and benefits for libraries and their patrons. To this end, a suitable topic was identified by closely assessing the current state of the literature and finding open questions for which an answer would create value. To achieve this, methodical literature research was conducted to get an overview of the research field. Afterward, a research gap worthwhile answering was identified. The studies to find answers to this gap are carried out in a cooperation between the Chair of Media Informatics at the University of Regensburg and the User Research Center at Harvard University[5], where research on HDC, for example, has already been conducted (Deschenes, n. d., 2020; Deschenes & Song, 2019).

2 Available at https://curiosity.lib.harvard.edu/ (Last retrieved: September 25, 2021)
3 Available at https://curiosity.lib.harvard.edu/american-currency (Last retrieved: September 25, 2021)
4 Available at https://curiosity.lib.harvard.edu/botanical-illustrations (Last retrieved: September 25, 2021)
5 Available at https://urc.library.harvard.edu/ (Last retrieved: September 26, 2021)

2 Related Work

In this section, the methodology of the literature research that was conducted is described. Furthermore, an overview of the research area of information visualization itself and in connection with libraries, as well as the identified research goal is given.

2.1 Literature Research

2.1.1 Methodology

Literature research was conducted based on the method of Webster & Watson (2002). The authors argue that the progress of the field of information systems, which the thesis at hand is connected to, can be increased by more literature reviews with a clearer structure and methodically based literature research (Webster & Watson, 2002, xiii). To that end, they suggest a methodical approach with multiple steps. Firstly, setting and describing boundaries, for example, temporal and contextual ones. Secondly, identifying relevant literature by scanning journals or databases and afterward conducting "forward search" and "backward search" via citation indices and bibliographies. Thirdly, to structure the review, they recommend creating an overview, for example with a concept matrix of papers and topics. Research gaps should then be identified with this overview and calls from the literature, for instance in future work and discussion sections. This, according to the authors, is the basis to demonstrate a contribution to the research field. Lastly, they state that all findings and potentially developed theories have to be assessed and discussed critically (Webster & Watson, 2002, xx).

2.1.2 Scope

Boundaries for the literature research were identified first. Scientific publications in German and English and of all types (articles, books, posters, videos, etc.) were considered. To determine relevant databases, the Database Information System (DBIS) was used. DBIS is a cooperative service by German li-

braries, which gives an overview of scientific databases and supports accessing and choosing the right one (Hutzler, 2003, 253). Currently, about 14,000 databases are included in total (University Library of Regensburg, 2021). The three DBIS subjects “Information, Book and Library Science, Manuscript Science”, “Media and Communication Studies, Journalism, Film and Theater Studies” and “Computer Science” are the three most relevant subjects for the present research topic. These subjects were scanned and in total, 19 databases were considered suitable for the literature research: “ACM Digital Library”, “IEEE Xplore”, “DBLP”, “TEMA”, “ITEC”, “IGI Global”, “Eurographics Digital Library”, “TIB Portal”, “Library, Information Science & Technology Abstracts”, “Scopus”, “Web of Science”, the pre-print servers “arXiv” and “TechRxiv”, as well as the search engines “Google Scholar”, “KVK” and “BASE”. Additionally, the publication servers of both University of Regensburg and Harvard University, and their respective library catalogs “Regensburger Katalog” and “HOLLIS” were taken into account.

Special consideration was given to the following conferences and their proceedings: “IEEE Visualization”, “EuroVis”, “PacificVis”, “IVAPP”, “SEE”, “VINCI” and the “BELIV workshop” as conferences with a focus on Information Visualization, “JCDL”, “ECIR” and “ECIS” from the disciplines of Digital Libraries and Information Systems, “ACM Multimedia” and “ACM SIGGRAPH” for Computer Graphics, as well as the Library Science conferences “Bibliothekartag” and the “ALA Annual Conference”.

1994 was chosen as the time constraint for this literature research. From this year on, all predecessors of the Joint Conference on Digital Libraries (JCDL) were founded. The Annual Conference on Digital Libraries in 1994 (Adam et al., 1995), the IEEE-CS Conference on Advances in Digital Libraries in 1995 (Adam et al., 1996), and the ACM Conference on Digital Libraries in 1996 (ACM, 1996), which were then first held together as JCDL in 2001 (ACM/IEEE, 2001). As the IEEE Visualization conference was held for the first time in 1990 (Kaufman, 1990), individual papers published before 1994 may be cited here nonetheless if they made a contribution important to this project.

2.1.3 Approach

To begin the research process, the two essential concepts for this work were identified: “Digital Libraries”, or more specifically in this case the digital collections of libraries, and “Information Visualization”. From these two, synonyms and related keywords were gathered, for example, “Visual Data Exploration”, and different combinations, like “Collection Exploration” or “Collection Visualization”, tried out. As suggested by Webster & Watson (2002), backward search via the bibliography of the found resources, and forward search, for instance via the “cited by” functionality of Google Scholar, was conducted to enlarge the literature corpus.

An overview of topics in the literature was created and calls from discussion and future work sections were extracted to form a comprehensive picture of the state of the research area and what lies ahead. These findings are described below.

2.2 Applying Information Visualization

An early and still important definition of information visualization is the “use of computer-supported, interactive, visual representations of data to amplify cognition” (Card et al., 1999, 637). This computer-supported type of visualization has the aim to communicate information and its structure clearly (Catarci & Cruz, 1996). This, however, can only be successful and useful to people if they are involved and their needs are taken into account (Bushell, Mackinlay, Ruh, Spoerri, Tesler & Gershon, 1994, 485). Moreover, if the resulting visualizations are individually adaptable by users, high value can be generated with them, according to Cruz (1996). Ioannidis (1996) describes this adaptability with the concept of “dynamic queries”, which let users alter the content of visualizations, for example with range sliders for year values. In contrast to the early discussions of these techniques in small circles (Gershon, Card & Eick, 1998, 1997, 1999), today, research on visualizations is conducted in a wide variety of fields, like for cultural collections (Bailey & Pregill, 2014). Working with large collections, however, is not new to the field. Keim (2002), for example, proposed a classification of visualization with large data sets early on.

Implementation and evaluation of information visualizations

There is much research on how to generally implement and evaluate information visualizations. Regarding the implementation, it is clear that software, in general, can achieve high quality by considering user experience issues in the requirements phase already (Kashfi, Feldt, Nilsson & Berntsson Svensson, 2016, 2). This is also valid for information visualizations, one especially relevant example being the non-functional requirement "explainability" that should be considered early during the design phase (Chazette & Schneider, 2020, 508). While Cysneiros & do Prado Leite (2004) construct a practically oriented conceptual model on such requirements, Davis, Dieste, Hickey, Juristo & Moreno (2006) show with a systematic review that interviewing techniques, preferably structured, are the most efficient strategy for requirements elicitation. Moere & Purchase (2011) argue that another non-functional requirement, the attractiveness, meaning the actual aesthetics in the design of information visualizations should be considered more strongly in research. According to results from a user study by Quispel, Maes & Schilperoord (2016), such attractiveness of graphs and charts seems to be strongly connected to familiarity and ease of use. It is also assumed that minimal changes like outlines influence the cognition of semantic relations between elements (Ziemkiewicz & Kosara, 2010). In fact, Moere, Tomitsch, Wimmer, Boetsch & Grechenig (2012) are able to show significant behavioral changes with three scatter plots of a different style. Sedlmair, Meyer & Munzner (2012) propose a methodological framework that supports the execution of such design studies.

Regarding the evaluation of information visualizations, Freitas et al. described in 2002 that evaluation issues are too seldom addressed for information visualizations (Freitas, Luzzardi, Cava, Winckler, Pimenta & Nedel, 2002). Plaisant (2004) argued that the then-current evaluation techniques for visualizations are not satisfactory. Instead, she explains, repositories of data and tasks would improve the comparability of interfaces, and case studies on real usage scenarios for target groups should be conducted. By now, information visualization evaluation is a more thoroughly researched topic. Besides the well-known heuristics by Nielsen (Nielsen, 1994; Nielsen & Molich, 1990), there are adapted versions

Angesichts der Veränderung digitaler Sammlungen und ihres wachsenden Umfangs müssen Bibliotheken neue Technologien einsetzen, um den Zugang zu ihrem Bestand zu gewährleisten. Informationsvisualisierung kann eine visuelle Möglichkeit zur effizienten Exploration solcher Sammlungen bieten. In den Bibliotheken fehlt es jedoch an Wissen über die Sichtweise von Nutzenden und an praktischen Richtlinien zur Entwicklung von Visualisierungen. Die vorliegende Arbeit soll dazu beitragen, diese Lücke zu schließen.

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