I Am a Data Visualization Designer in an Academic Library, and More!

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Michael J. Stamper
Data Visualization Designer and Digital Arts Consultant
Virginia Tech University Libraries

Many academic institutions offer various forms of data and information finding services through their libraries to students, faculty, administrators, and the general public. These services often include help with data analysis, data management, Geographic Information Systems (GIS), and data visualization. The service not always offered regarding data visualization and information design is having the support and guidance of someone experienced in graphic, interactive, visualization, information design in place to assist in, or lead the creative process. As the Data Visualization Designer within the Virginia Tech University Libraries Data Services group, I am the person that provides consultations and aids in the design and development of effective, meaningful, and impactful visualizations for a wide range of media types and audiences. This editorial will address the benefits of using a holistic, “Design Thinking” approach in the realm of data visualization and information design services through my first-hand experiences and knowledge gained through my work specifically relating to data visualization at Indiana University Libraries (Bloomington campus), and through my current position at Virginia Tech University Libraries.

So what’s the difference between “data visualization” and “data visualization design” if most academic libraries are offering data visualization as a service? Where does the “design” aspect come in? The difference is technically anyone can take their data, find software that will render it, create a visualization, and be done with
it. But, creating a visualization that is more effective, impactful, and targeted towards an audience, requires a human to be involved in the visualization and design process. This involvement includes post-processing in Adobe Illustrator or Inkscape to modify colors, pull edges and nodes to the forefront or highlighting them in some way to give them meaning, adding labels, legends, choosing fonts, and laying out all of this work so it doesn’t look “designed” – after all, the main focus should always be on the visualization, or information that needs to be conveyed. There are a couple of case studies further down that demonstrate some of these applications of design techniques.

There are hundreds of tools that can visualize data running the gamut from downloadable freeware to subscription-based applications. One of the hardest parts about my role as a consultant is answering the question about which software is the best for creating visualizations, which I always reply with a question or two about the nature of what they are planning on visualizing and how they’d like it rendered. Will it be a simple chart/graph? Will it involve a geospatial map? Will it be a big abstract blob of a network consisting of nodes and edges? Perhaps a combination of a network and geospatial map? The simple answer is to ask them to come talk to me, send me more details about their project, and if possible, send me examples of visualizations they’ve seen that they’d like to base their own work on. I can usually figure something out once I get more details, and then I can answer the question of what the best tool is that will work for what they need to be seen and understood.

Because I am a consultant, I do not expect credit for my work as a designer for my clients – I am a library service – hence, I only get credit on work when a researcher asks if they can give me credit, which I’m more than happy to receive. Within the Data Services group, my Deans, and other decision-makers at the university, I do get full credit for my work that I do for others. I have a vast amount of work that I can share internally with my colleagues, just not to the public – hence the lack of a portfolio of visualizations that researchers can see before asking for help, or setting up a consultation. This makes promoting the data visualization and information design services that are available quite difficult. Promoting these services is usually through word-of-mouth, workshops on data visualization and graphic design fundamentals, and demonstrating various software (Tableau, Adobe Creative Cloud,
and Gephi are popular) for rendering and designing data visualizations and other types of information.

I Am a Library Service

I am a consultant. My skills are used for rendering data into visualizations and also sought after as a designer for these visualizations, which includes data and other types of information that is more on the infographic side of visualization. I lead my clients coming from diverse disciplines through the design process for their data visualization and information design wants and needs. This includes talking with them about their data or helping them find it, discussing what they need to be seen and who the intended audience might be (General public? Subject matter experts? Decision-makers?), and where the finished product will be displayed (print, Web, poster, publication, adaptive/responsive website?, etc.), and other possible constraints that may affect the final design (color, grayscale, size). We also discuss concepts for the visualizations(s) that need to be produced, if there are any, and if not, I will come up with a few to present if I feel it will make their work even more exciting or impactful. Throughout the design process and subsequent iterative stages, I use a loose “Design Thinking” approach. Although I have been using this approach for years before even coming to Virginia Tech, this approach has proved very effective when applied to the types of projects that I work on in an academic research-oriented environment. It’s especially useful when talking with clients about their work and explaining the value of using this approach as we work together to identify the most effective means of visually explaining their work to different audience types, i.e. general audience to subject-matter experts.

This process can be highly iterative, due to shifting requirements once preliminary designs are passed to the client for feedback and comments. Following this model is not always possible, most often due to time constraints on the client’s end, and my backlog of requests for help, so jumping right in to the prototyping phase is not uncommon. For grant work that requires my expertise, in which I am on the grant and listed as a Co-PI, I have the opportunity to apply the whole “Design Thinking” process to the project.

How Did I Get Here?

How did I come to be in my current role, and what qualifies me to consult and work on the projects that come across my desk at Virginia Tech? This position was first created in 2016, the year I was hired. I have a BA and an MFA in graphic and interactive design, both from Indiana University–Bloomington, as well as experience working for Dr. Katy Börner’s Cyberinfrastructure for Network Science Center, and served as co-curator (and sometimes designer) for her Places & Spaces: Mapping Science exhibit, which is a vast collection of static prints and interactive kiosks of visualized data. My background also includes having worked on many interactive projects for academic institutions I’ve been affiliated with, Federal entities (NIH, NIEHS, NTP, NPS, NAVSEA), and advertising and public relations agencies. I pretty much do everything from user research, information architecture, user interface design (UI), user experience design (UX), interaction design (IxD). If someone needs data or information made visible and transformed into pieces that can communicate the main ideas, or story within the data in a thoughtful way, then they can ask me – after all, I am a library service. This frees up my clients to focus on their research, while I support them (credit given or not at the discretion of the primary investigator) and take their data or information that needs to be graphically represented and transform it into something that is visually appropriate and effective for the preparation of proposals, submission-ready review papers, and conference-ready presentations for general audience types to subject matter experts. I will concept for it, visualize it, design it, and format it for different media types for communication. As a library service, I’m here and happy to help, because as I’ve found out, beyond the need for basic data visualization assistance, there is an even greater need for an information and interaction design service that encompasses all aspects of creating meaningful visual communications. Part of my service to the university is serving on The Virginia Tech Faculty Activity Support Team (VT-FAST), in which I am the data visualization and information design expert. This group is specifically designed to assist and foster research performed here at Virginia Tech. It is, once again, a way for researchers to focus on their grant writing and research, while having a support team to call upon for assistance and advice. I also teach regular workshops on data visualization and graphic and interaction design fundamentals, as well as basic visualization and design software.

Case Studies
The following two projects are from a couple of requests that I recently worked on and examples of taking data and information and transforming through the application of “Design Thinking” and basic graphic and interactive design principles. The first project is a basic network map. For this article, I’m using a network in which I have removed the names and all other identifying information in order to not share my client’s data, research, and results.

Abstract Network to Tube Map

Figure 1 (below) is a client request to take a simple dataset consisting of 21 colleagues (all from the same department) here at Virginia Tech, and visualize each individual’s connections to each other through their contributions to a defined set of five shared tasks. Visualizing this kind of network is easy, and can be done using Gephi, a freeware network visualization program, that is described as “the Photoshop™ of network visualization.”

After a few built-in algorithmic applications, manual stretches, color adjustments, node size tweaks, and renders, I had my first few drafts of a visualization that I could send over to my clients for review and feedback. In my experience, a visualization is usually not completely refined and as good as it can be without a few iterations and adjustments, so I know that every time I make something, it most often comes back with edits – which is fine!

Figure 1.
After this first render, my clients expressed that this visualization was not as clear as they’d like, and that they were open to suggestions on how to refine it. I’ve always wanted to do a London Tube map-style visualization and this was the perfect opportunity to take my love for graphic, information, and transportation design (and London!) and apply them to a somewhat small network visualization.

Figure 2.
For more information about this project see: We Can Do Magic: Transforming an Abstract Network Visualization into a London Tube Map. Project from Spring-Summer 2018.

I presented this concept to my clients, who were excited about the prospect, so I moved forward and transformed the Gephi-generated visualization into a Tube Map (Figure 2).

Comparing the Gephi render with the Tube Map visualization (Figure 2), you’ll notice that node size is still used, tasks have been separated into their own lines (multiple tasks making up for the lost width in the Gephi render), and the visualization has been flattened, so it’s easier for users to see, trace, and engage with the visualization. Plus, it looks really cool, and made my clients very happy!

*Design Thinking for Visualizing Acid–Base Chemistry*
This second project is more on the information, interactive, and user experience design side of the spectrum – less data visualization, and more of a taking a human-centered approach to building a tool so that users could interact with the visualization.

This project involved the planning and designing a custom user interface (UI) and visualization that are “user-friendly”, and incorporates the World Wide Web Consortium’s Web Content Accessibility Guidelines (WCAG). Using a “Design Thinking” approach, all aspects of the design of this tool – User Interface (UI), User Experience (UX), Interaction Design (IxD), Graphic – were taken into account.

In Figures 3 and 4, you can see some of the comments, questions, and scribbles from the first team meeting to discuss division of work, benchmarks, and goals. You can also see some thoughts on HOW users will interact with these defined input fields. Figure 5 is a somewhat high-fidelity wireframe of the interface that is showing basic layout and functionality. In short, these are demonstrating the design and development of a tool geared towards a particular audience and tailored to how we want them to use it.

Figure 3.
2. Static image for diagram & calculator; dynamic visualization with slider will be developed.

3. Calculator

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Figure 4.
Figure 5.
Download the poster and learn more about this project that I presented at the 2019 Gordon Research Conference on Data Visualization in Science and Education, here:


Conclusion

In conclusion, I’d like to stress that data visualization and design as a service is complementary to the other services dealing with data within our library. There are the same concerns about privacy, archiving, and open access. My colleagues and I work as a team, and regularly consult with each other as much as we do with our clients. More often than not though, my work as the Data Visualization and Information Designer is unique, because it is meant to be seen, understood and interacted with by known and unknown audience types – it can be very public-facing. The “Design Thinking” methodology is a human-centered approach to working through the projects that places the emphasis on the user, and designing for their benefit. I highly recommend using this framework when devising visualizations, charts/graphs, graphics, or interactive products – when time allows. It has been my experience that the work that I do is stronger, more impactful, and successful applying this framework, which makes my client’s work stronger, impactful, and shine a little brighter than it would without the benefit of a data visualization and information designer in place at the library and ready to help!