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putting the pieces together: theory and practice

Full-Length Paper

Assessing and Improving Library Technology with Service Blueprinting

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Abstract

Objective: The objective of this article is to illustrate the application of service blueprinting—a design tool that comes from the service design tradition—for assessing and improving library technology services.

Setting: A mid-sized library at a public university in the western United States.

Methods: A service blueprint was co-created by library and IT staff in a design workshop in order to map the operational flow of a data visualization display wall.

Results: Guided by the service blueprint, the project team identified points of improvement for the service of the data visualization display wall, and developed recommendations to aid further applications of service blueprinting.

Conclusions: Ultimately, service blueprinting was found to be a useful tool that can be applied to assess and improve library technology services.

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Keywords: service design, service blueprint, user experience, assessment, data visualization, display wall

Introduction

Academic libraries and information technology (IT) departments are embracing new technology services related to data and digital scholarship. Tools and strategies adapted from service design and design research—such as service blueprinting—can help libraries assess, improve, and innovate services involving new technologies. Service blueprinting produces a detailed and comprehensive view of the operation of a service. As one tool in the design toolbox, service blueprinting can be applied to create services that benefit library users and staff alike. In this article, we discuss the application of a service blueprint for assessing and improving the service operation of a data visualization display wall. This article is intended to introduce service blueprinting as a tool that other libraries and information organizations can use to assess and improve new technology services.

Background and Context

Library Technology Services

With the surge in data-driven research, libraries have introduced new technologies that support technologies relating to data and digital scholarship. The *NMC Horizon Report: 2017 Library Edition* outlines seven categories of technology relevant to libraries, including consumer technologies (e.g. drones, robotics, wearable technology), digital strategies (e.g. makerspaces, preservation & conservation technologies), internet technologies (e.g. the Internet of Things, library services platforms), learning technologies (e.g. adaptive learning technologies, mobile learning, virtual & remote labs), social media technologies (e.g. crowdsourcing, social networks, virtual worlds), visualization technologies (e.g. 3D printing, data visualization, virtual reality), and enabling technologies (e.g. artificial intelligence, big data, flexible displays, virtual assistants) (Adams Becker et al. 2017). Many universities offer labs, services, and tools to promote and support these technologies. These labs may be run by the library, by campus IT, by university departments, or through partnerships between these entities. University technology services are often promoted on the web[1], and some universities have applied assessment strategies such as pilot projects (Ray and Cook 2017) and surveys (Wu et al. 2014). Design tools such as service blueprinting can be applied to further enhance assessment and innovation of technology services in libraries.

Service blueprinting

A service blueprint is a visual flowchart of a service operation. Service blueprints are created to assess and improve a service by comprehensively illustrating the course of a service operation, including user-facing interactions, behind-the-scenes staff actions, and the information technology systems that support the service. A service blueprint is designed to capture the full range of a service operation, and can help to solve problems in the operation of a service by identifying points of friction or failure that a user may encounter (Dickinger and Leung 2017).

1 See Research Technologies at Indiana University (https://pti.iu.edu/centers/rt); Visualization Spaces and Technologies at North Carolina State University (http://www.lib.ncsu.edu/visualization/visualizationspaces); Center for Digital Scholarship at Brown University (https://library.brown.edu/cds); Scholar's Lab at University of Virginia (http://scholarslab.org); Robotics Lab at University of California at San Diego (http://ucsdnews.ucsd.edu/feature/giving_students_a_place_to_prep_for_tomorrows_virtual_reality_economy).

The scope of application for a service blueprint is wide-ranging, and is limited only by the definition of a service itself. In the context of a library, a service can be understood to include any interaction that a user undertakes to access information or fulfill a task. A service can be found in the digital space of the library, such as web sites and databases, and through interpersonal exchanges, as in reference and circulation interactions. This inclusive view of a service can also encompass the physical space of the library, including any objects or technologies that a user interacts with, such as books, magazines, tables, chairs, computers, and data visualization display walls. In essence, everything within a library has the potential to operate in service to user goals (Marquez and Downey 2016, 14-17). From this perspective, everything in a library can be assessed and improved with service blueprinting.

As a design and assessment tool, service blueprinting comes from the service design tradition (Shostack 1984; Patrício, Fisk, and Falcão e Cunha 2008; Marquez and Downey 2015; Trischler and Scott 2016). Service blueprinting has been applied to evaluate services across disciplines, including car parking (Wreiner et al. 2012), cloud computing services (O'Flaherty et al. 2012), electronic health services (Chang and Lin 2011), mobile technologies (O'Connor et al. 2015), and movies theaters (Chiu et al. 2013). Notably for the context of libraries, service blueprinting has been applied towards public services in libraries (Schmidt and Etches 2014; Pretlow and Sobel 2015; Marquez and Downey 2016) and universities (Baranova, Morrison, and Mutton 2011; Bitner, Ostrom, and Burkhard 2012; Madden 2015; Kim, Lee, and Cha 2017).

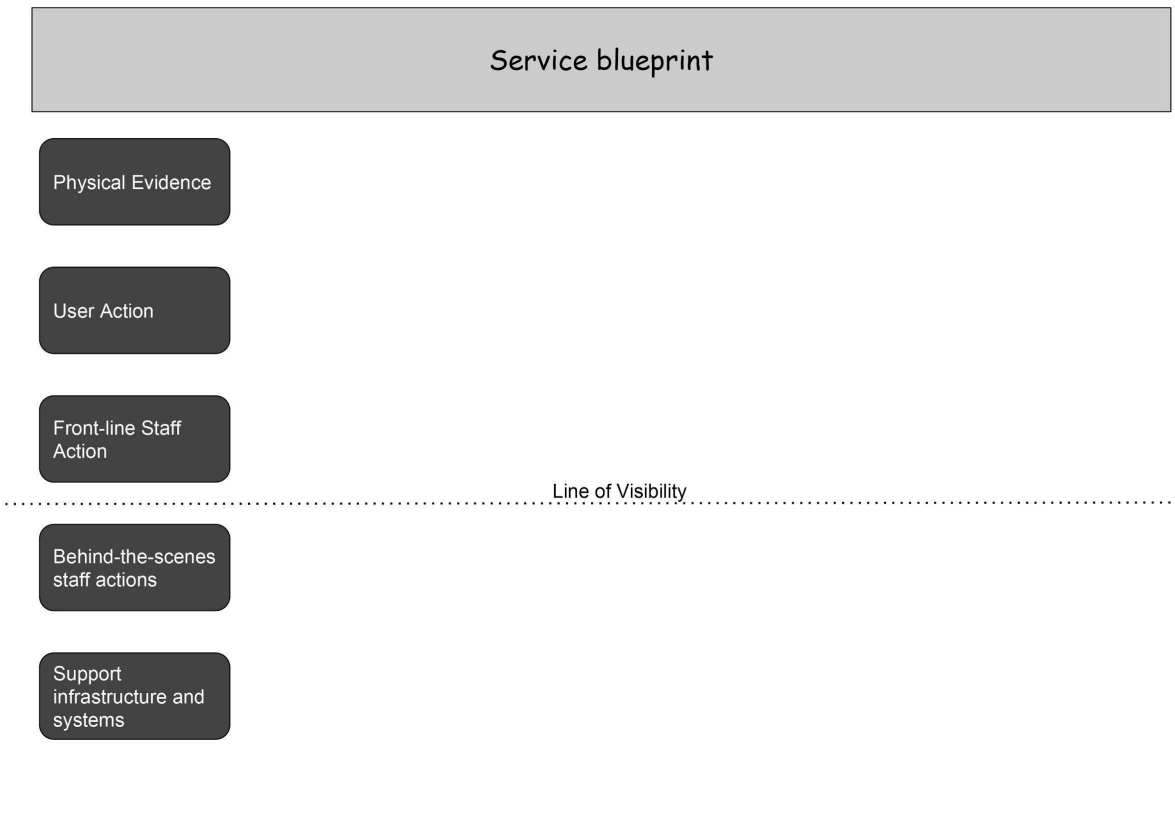

Figure 1: Blank Service Blueprint template

The service blueprint is commonly presented as a two-dimensional diagram, with progress through time represented on the x-axis and corresponding segments of the service represented on the y-axis (Figure 1).

Figure 1 demonstrates a blank template for a typical service blueprint. In this example, five key service segments are highlighted:

- *physical evidence* identifies what or who users interact with
- *user actions* identify what users are doing during the course of the service operation
- *front-line staff actions* identify the interactions that occur between staff and users
- *behind-the-scenes staff actions* identify the staff work or coordination conducted that occurs out of view from users
- *support infrastructure and systems* identifies the equipment, technology, and space required to provide the service
- the *line of visibility* delineates the service components that are visible to users from the components that occur away from users' line of sight

To complete a blueprint for a specific service, the operation of that service is visually mapped according to the above segments. Notably, the service blueprint is created by library staff—without direct input from end-users. In this way, the blueprint represents a conceptual model of a service, and functions to illustrate the relationships among the various component parts that comprise the service. As one service design tool among many, the blueprint may be combined with other tools to gain even greater insight into a service. Journey mapping, analytics, user interviews, ecology maps, and mobile ethnographies are just a few examples of related design approaches that can complement a service blueprint (Schmidt and Etches 2014; Marquez and Downey 2016; Marquez and Downey 2017). Among these related tools, service blueprinting uniquely combines three attributes. First, the service blueprint is scoped around the operational flow of a service. Second, the service blueprint provides a visual through line to illustrate the operational components of a service. Third, the service blueprint is completed by library staff, without direct input from end-users.

In the case study section below, we will complete this service blueprint template and further demonstrate and discuss its usefulness for library technology services.

Case study for Blueprinting a Library Technology Service

Data Infrastructure and Scholarly Communication (DISC)

The Montana State University (MSU) Library has invested in strategic areas in recent years, including data services and digital scholarship. As these new services have grown, so too has the collaborative relationship between MSU Library and the University's central information technology unit, University IT (UIT). In 2015, the Library and UIT formalized a partnership by founding the Data Infrastructure and Scholarly Communications (DISC) group. DISC provides MSU researchers with resources and expertise related to data services, scholarly

communication, digital scholarship, and research cyberinfrastructure. By integrating the research support services of the Library and UIT, DISC ensures that such services and knowledge are accessible and responsive to researchers and partner organizations at MSU, with the overall goal of advancing research and amplifying impact[2].

The CyberDiscovery Display Wall

In July 2016, the Library and UIT received internal funding to purchase and install a data visualization display wall. The main floor of the Library was selected as the most suitable location for this wall, as it offered a centralized location and potential to capture the attention of multiple user groups.

DISC was charged with steering this project and elected to implement visualization wall hardware and software similar to CyberCANOE (Collaborative Analytics Navigation and Observation Environment) at the University of Hawaii[3]. The CyberCANOE is an immersive, collaborative space that allows students and researchers to explore data from new perspectives. Following the purchase and installation of the software and hardware, we renamed the wall CyberDiscovery in order to reflect the association with DISC and to distinguish it from the CyberCANOE. A DISC CyberDiscovery subcommittee was formed to manage the launch and subsequent use of the wall. The CyberDiscovery display wall was unveiled to the public in January 2017.

Creating a Service Blueprint for the CyberDiscovery Display Wall: Version 1

In April 2017, a group of 15 library staff conducted a design workshop on service blueprinting. The workshop focused on our internal understanding and conceptualization of the service operation of the display wall. No end-users participated in the workshop. The workshop was facilitated by members of the library staff who have a background in service design and design research. Workshop participants were introduced to the service blueprint tool using the descriptions available from the Learning Space Toolkit website[4]. After discussing the background and purpose of service blueprinting, participants formed into small groups of 4-6 and were asked to design a blueprint for a library service of their choice. One group chose the display wall for their service blueprinting exercise, identifying a need to understand better how to support the display wall through staffing and infrastructure. This group used the service blueprinting exercise to answer certain critical questions about the display wall that they had identified, including:

- How will users locate and interact with the display wall?
- Who is responsible for the service?
- What is the impact of the service on Library personnel and physical space?

2 Montana State University. 2017. "Data Infrastructure and Scholarly Communication (DISC)." https://www.montana.edu/disc/

3 For more information about the original CyberCANOE at the University of Hawaii, please see http://lava.manoa.hawaii.edu/cyber-canoe-cyber-infrastructure-enabled-collaborative-analysis-navigation-and-observation-environment/

4 The Learning Space Toolkit offers free resources for Service Blueprinting and other tools such as Personas and Journey Maps: https://learningspacetoolkit.org/services-and-support/service-blueprint/

- Will additional support be required to successfully deliver the service?

These questions—which focus on the operation of the display wall—highlight the purpose and application of a service blueprint as a tool for assessing and improving the operation of a service.

To complete the blueprint, workshop participants then documented the five key service segments of the display wall: *physical evidence, user actions, front-line staff actions, behind-the-scenes staff actions,* and *support infrastructure and systems*. Discussion was guided by the structure of the service blueprint. Individual components of these service segments were recorded on sticky notes and sequentially added to a poster-sized service blueprint template, which is represented in Figure 2.

In this blueprint, progress through time is represented horizontally along the x-axis, and the corresponding segments of the service are represented vertically along the y-axes. This service blueprint represents the sequence of steps that a user takes in locating and using the display wall. As we imagine users moving through the service, each step is sequentially recorded according to the five key service segments. For example, the workshop participants identified that the first *user action* would be to "enter the library." Concurrently with this user

action, the group identified that the *front-line staff action* would be to staff the "borrow desk;" the *physical evidence* would be the Library's "lobby;" and the *behind-the-scenes staff actions*

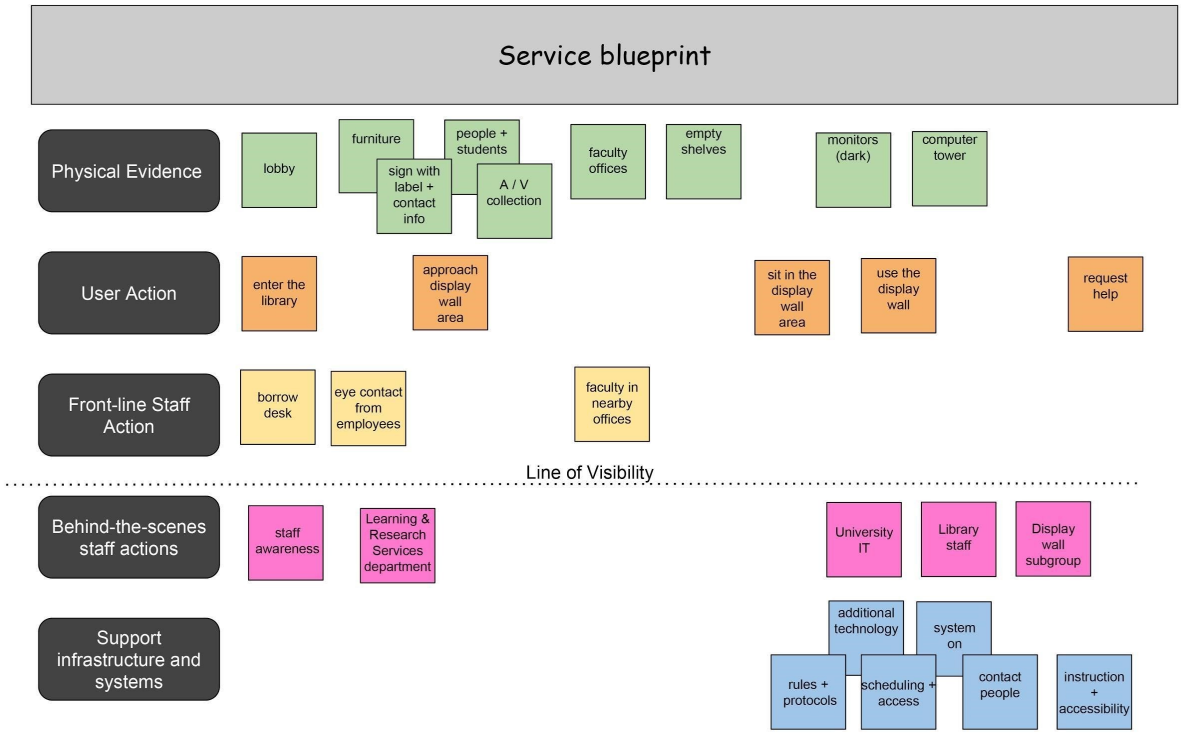

Figure 2: Service blueprint, version 1

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would be a “staff awareness” of users. From this point, participants completed the blueprint by identifying each component part of the operation of the display wall as users and the service flow forward through time.

This version of the blueprint represents the then-current operation of the service. Version 2, which will be described in the following section, represents an updated blueprint that identifies improvements in the operation of the service.

Creating a Service Blueprint for the CyberDiscovery display wall: Version 2

After the design workshop, the service blueprint was presented to the display wall subcommittee for feedback. By providing a visual map of the display wall service, the blueprint allowed the subcommittee to identify specific points of improvement for the service. The subcommittee then added new sticky notes that recorded these points of improvement (see Figures 3 and 4, with notes outlined in red representing new ideas for service improvement).

In co-creating the service blueprint, library and IT staff generated a number of insights that led to new service improvements.

Service Improvements Developed from the Service Blueprint

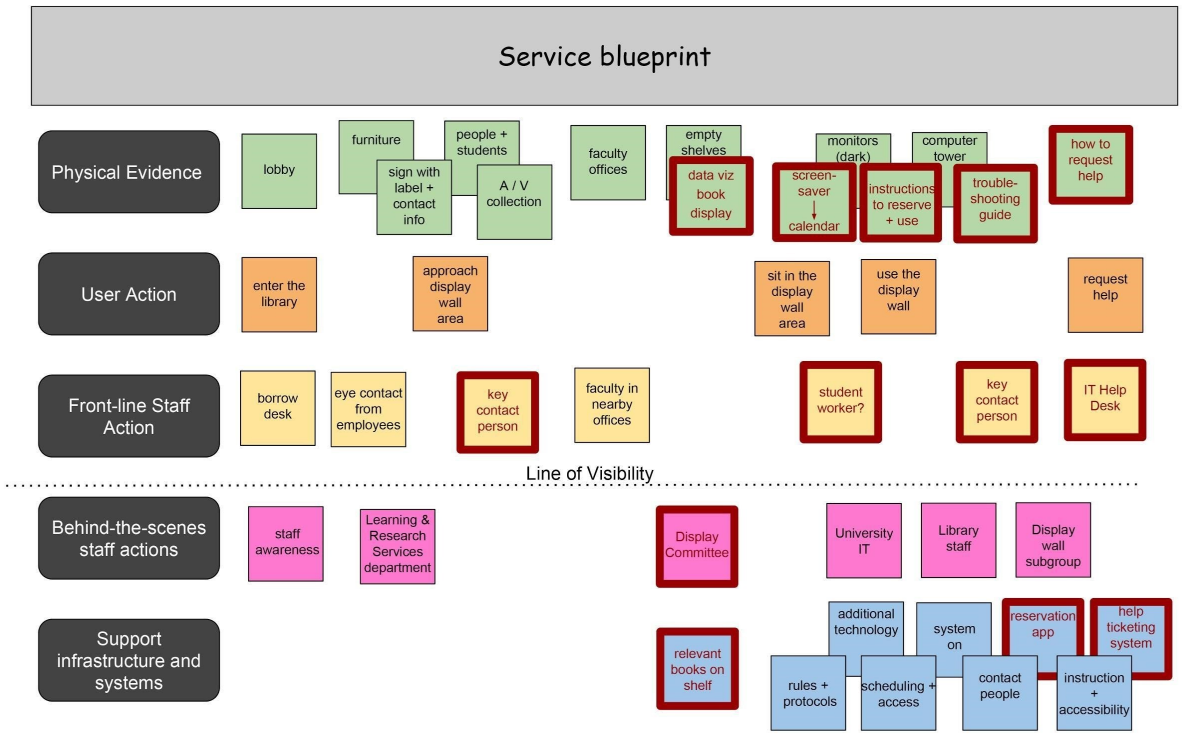

Figure 3: Service blueprint, version 2. Sticky notes outlined in red represent ideas for service improvement.

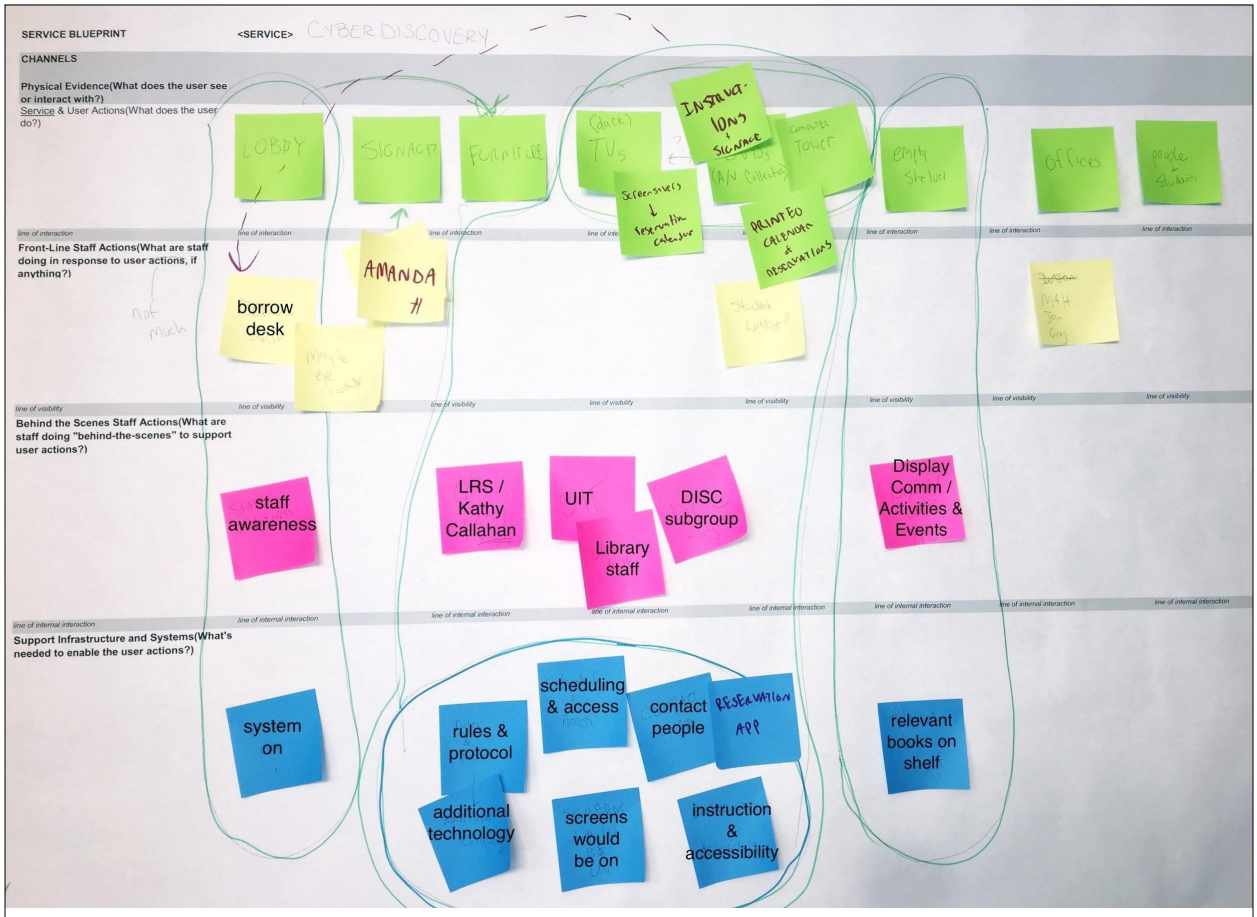

Figure 4: Service blueprint, version 2. Design artifact

Wayfinding and Usage

Within a complex physical space layout that may be unfamiliar to users, we recognized that the display wall service would benefit from additional signage and usage instructions. The blueprint also helped the project team see that the service lacked clear instructions for use. In response, we placed signs with basic information about the system near the display wall (see Figure 5, Figure 6, and Figure 7), and we also provide detailed usage instructions both online and in the display wall area[5]. University IT hosts training sessions for a university supercomputer at the display wall, which introduces new users to the display wall while learning about adjacent services. As demand for the display wall increases, we will likely need to host on-boarding sessions to introduce users to the service.

Staff Training and Responsibilities

When we introduced the display wall to our physical space, we also introduced new user pathways through the space and new users needs based around the service. Consequently, we also introduced new needs and pressures on library staff. The service blueprint was a

5 Full instructions for usage of the MSU CyberDiscovery display wall: https://www.montana.edu/disc/projects/cyberdiscovery/

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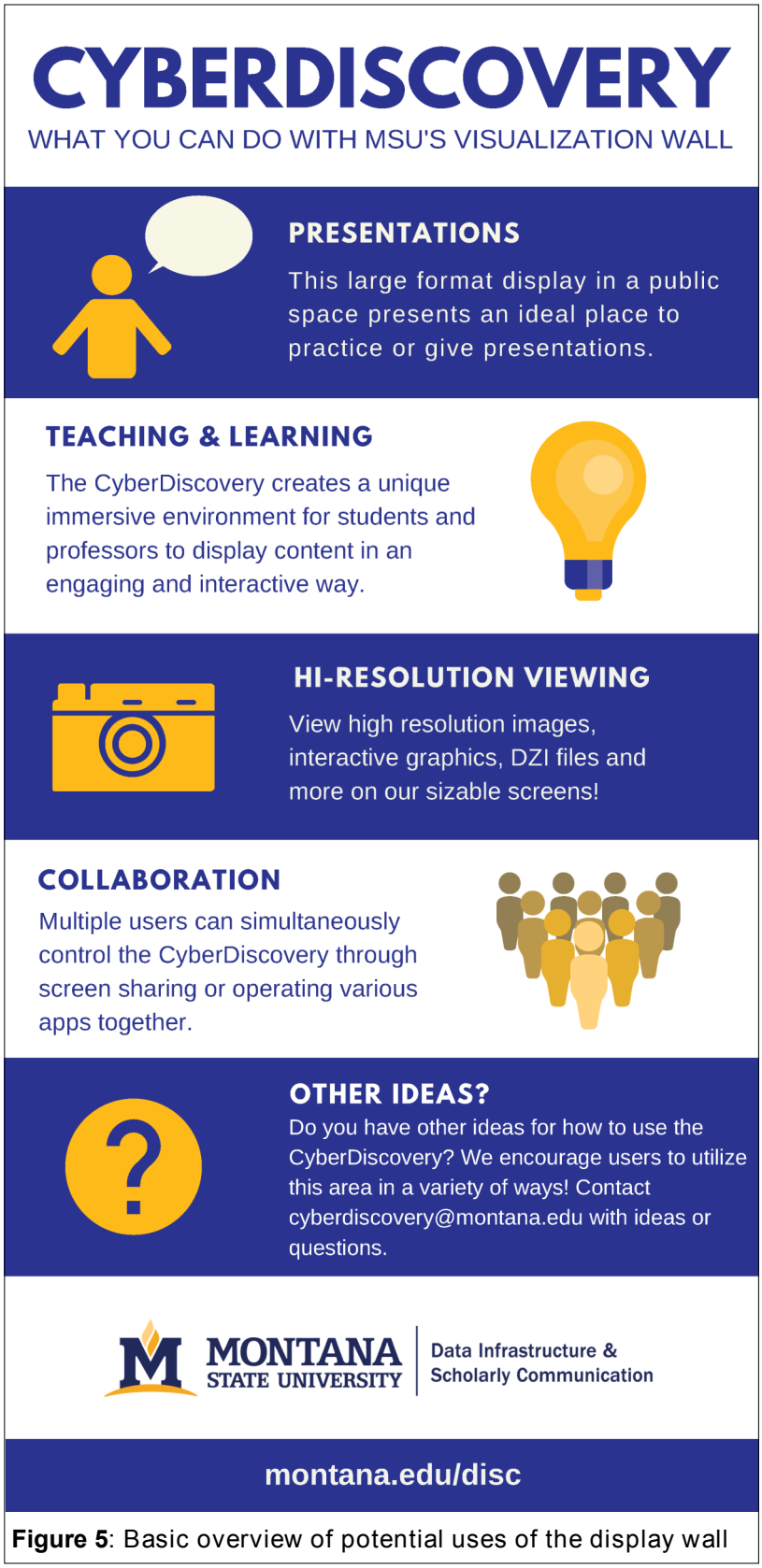

Figure 5: Basic overview of potential uses of the display wall

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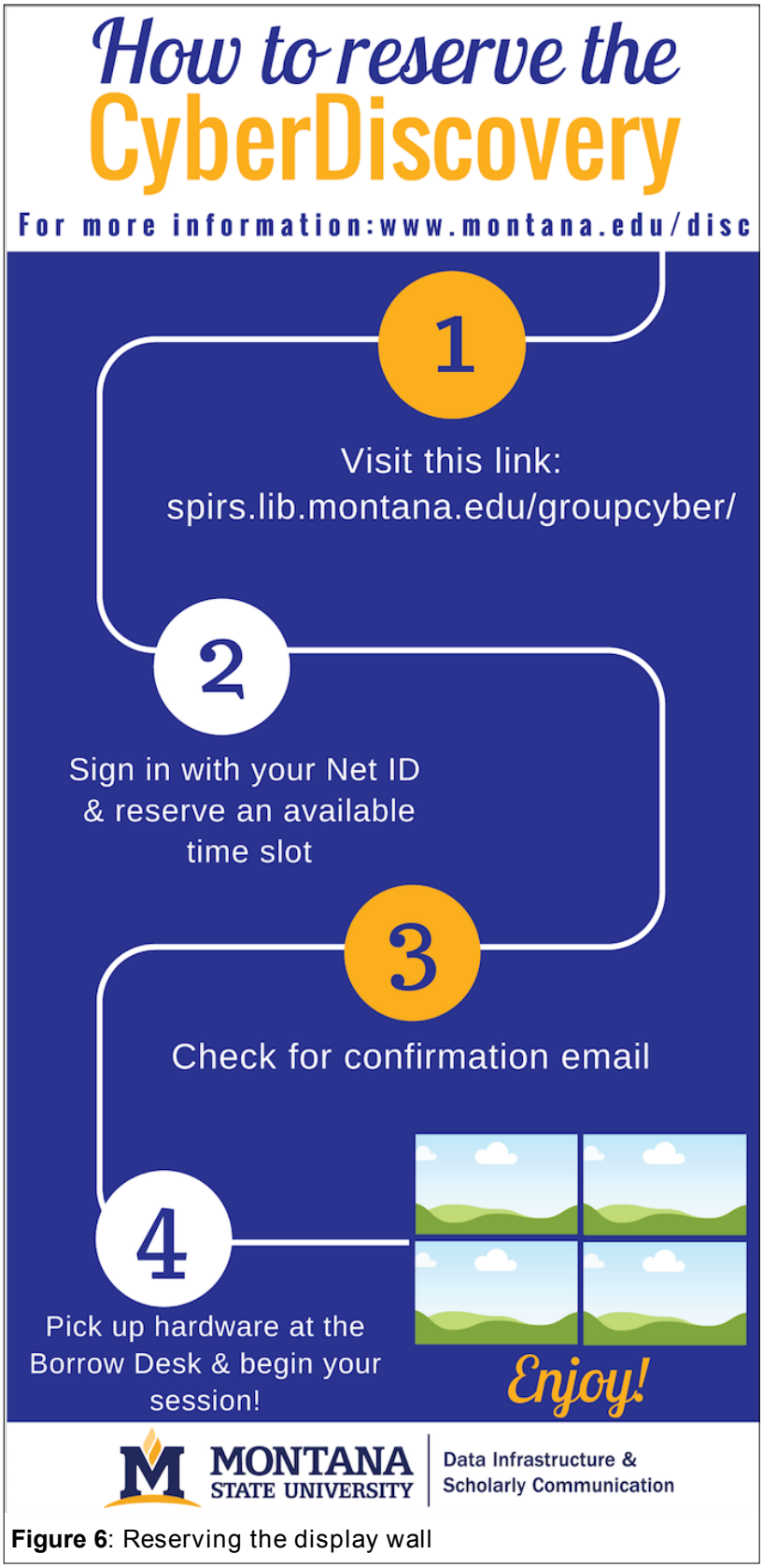

Figure 6: Reserving the display wall

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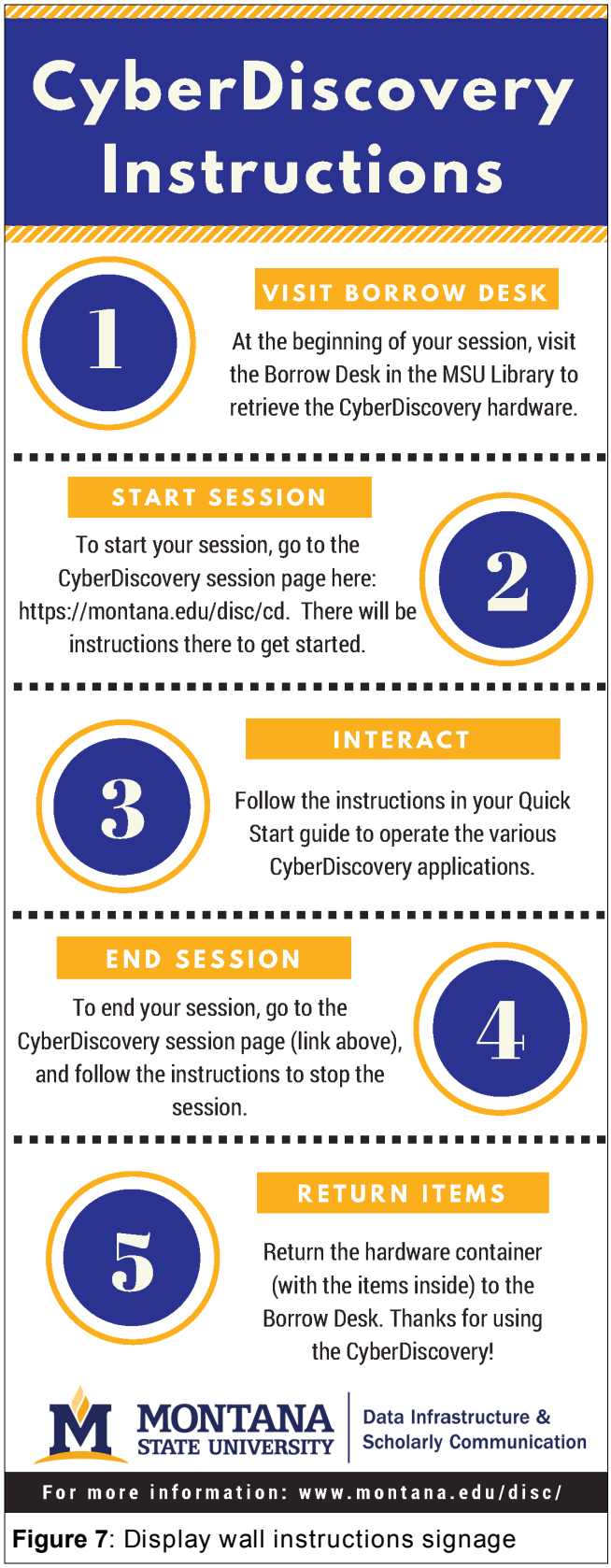

Figure 7: Display wall instructions signage

useful tool for highlighting these new staff needs, and for clarifying the interplay between our public services and IT staff. The service blueprint illustrated that a variety of staff is responsible for the service at various points throughout the duration of its operation. We learned that additional support and staff training will be necessary so that users can be directed and instructed as to the location and use of the display wall. The blueprint helped the project team understand that the display wall was in fact much more complicated than we had initially realized. In terms of front-line support, public services personnel are responsible for directing users to the physical location of the wall. Because the display wall is openly available to users during all of the Library's hours of operation, the Library's public services personnel were also trained in basic usage of the display wall, in order to answer simple questions during evening and weekend hours. Currently, one University IT employee is tasked with overseeing the technical support of the display wall, and a small team of Library and University IT staff members are trained to help users operate the display wall. We also implemented a help ticketing system to provide structure and documentation for technical support. To ensure that both staff and users can receive immediate help if necessary when interacting with this new and complex service, we identified a key contact person for the service and included their contact information in both online and physical spaces. This contact person can provide on-call support when users of the display wall experience issues that must be solved immediately.

Strategy and vision of the wall are overseen by the display wall subcommittee, which develops new ideas and collaborations for the display wall service. The subcommittee is also responsible for designing the display wall webpages, conducting promotion and outreach, and recruiting a cohort of initial users to become case studies and champions for the service.

As use of the service increases, more questions will inevitably arise that will need to be answered. For instance, who can act as backup if our technical support staff member is not available? What role can student employees play in supporting the display wall? And what can be taken off of the plates of public services staff in order to make room for additional display wall support?

Always-on Monitors

Before we created the service blueprint, a potential user of the display wall would encounter blank monitors when approaching the display wall area. To make the system more engaging and self-promotional, the display wall subcommittee has begun to display screensavers with colorful imagery and video, along with a calendar that displays the times at which the display wall is reserved or available for use. When events are held in the library, the display wall now displays content relevant and complementary to that event. For example, we streamed videos of Indigenous dance during the week of our local Native American Powwow.

Calendar and Online booking

The blueprint also helped the project team see that the service lacked clear instructions for booking. In response, we implemented an online reservation application that will help connect users with the service and coordinate staff around the display wall. Library technology staff are responsible for providing behind-the-scenes support that helps ensure a smooth operation of this reservation system. As demand for the display wall grows, we will need to address additional questions about how usage will be prioritized. For instance, should a faculty member

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who is using the display wall for research or teaching be prioritized over a student who is using the wall for experimentation? Or should the display wall be available on a first-come, first-served basis?

Book shelves and furniture

Version 1 of the service blueprint shows a gap when a user approaches the display wall area and sees empty shelves adjacent to the display wall monitors. To improve this experience, the subcommittee has filled the empty shelves with books and objects relating to data visualization, thus placing the display wall in context with current data visualization knowledge.

Depending on how the display wall space is being used, furniture must be rearranged or additional furniture must be brought into the space. For day-to-day use, a few lounge chairs and side tables are arranged in the space so that users can gather near the wall. When classes or lectures are held at the display wall, chairs from a nearby flexible classroom are repurposed (see Figure 8). As use of the display wall increases, the Library may need to purchase additional furniture and seating specifically for use in the display wall space.

Figure 8: The display wall just prior to a speaking event, with many improvements in place, including our new poster-sized usage instructions and bookshelves with materials relevant to the display wall content.

Anticipating future issues

As demonstrated above, service blueprinting can be a springboard for insights and useful questions that the project team might not otherwise have anticipated. Service blueprinting not only helped us identify current gaps, but it helped us identify further questions that may arise as use of the display wall increases.

Discussion and Recommendations

The service blueprint proved to be an appropriate and useful tool for assessing and improving the service of our data visualization display wall. The specific insights and improvements generated from our service blueprint apply only to the display wall and its local context. However, the practice of service blueprinting outlined above can be applied to display walls at other institutions to produce localized insights. Indeed, a blueprint can be created for many technology services in order to produce new insights and improvements. Blueprinting can be adapted creatively for a variety of services, including 3D printing, makerspaces, adaptive learning technologies, scanning, technology lending, voice interfaces, chatbots and virtual assistants, virtual reality, and augmented reality. As a flexible and adaptable tool, the service blueprint can be used to assess, improve, and innovate any of these services.

In our experience, the blueprint is also useful for building a shared understanding of a service and its operational requirements. Before we created the blueprint for our display wall, our library staff each had different ideas about how the service worked and what was necessary to deliver it. After we created, discussed, and refined the blueprint through two iterations, the project team came to a consensus about the operation of the wall, and as a result we were better able to advocate for support staffing and infrastructure for the service. The ultimate outcome is a more useful and usable experience for the students and faculty who use the display wall.

In creating a service blueprint for our data visualization display wall, we have developed three key recommendations that other institutions can use to inform their own application of service blueprinting:

1. Building a shared understanding through service blueprinting.
2. Defining operations and generating insights.
3. Integrating with complementary tools.

Building a Shared Understanding through Service Blueprinting

When designing and delivering services, it can be challenging to bring together multiple perspectives around a consensus for change and improvement. For newer library technology services such as data visualization display walls, the details of service operation may be difficult to translate from the abstract to the concrete. To aid in the discussion, a blueprint can be useful for structuring and guiding dialogue among a diverse group of stakeholders. The service blueprint can provide a common vision for new or existing library technology services.

At our library, we found that the service blueprint allowed us to focus our initial discussion about the display wall. The service blueprint facilitated our dialogue around the service, helping us organize our thoughts and focus on the key elements of the display wall. The service blueprint exercise also promoted a collaborative and co-creative process of evaluating and improving the service, encouraging inclusion of a variety of communication styles and cultures. Members of the display wall subcommittee who tended to be quieter in meetings were able to create sticky notes and contribute meaningfully to the conversation. The group that created the display wall service blueprints included librarians and IT professionals with backgrounds in UX, data management, statistical analysis, discovery services, patron outreach, and systems administration. The blueprint exercise allowed these diverse subcommittee members to each share ideas and perspectives. When visualized coherently through the blueprint, our combined view of the service proved helpful for establishing a shared understanding and a consensus for service improvements.

The process of creating Version 2 of the service blueprint was especially helpful to build consensus in our ideas for improving the service. Version 1 of the blueprint clearly showed the gaps in our service—gaps that were visible to all of us, regardless of whether we came from public services or technology backgrounds. The service blueprint provided clear evidence that bridged library-IT politics and other potential disagreements, and ultimately allowed us to work together to improve the service. Gathered around the blueprint, we were able to come together as a team with a shared understanding of how the display wall functioned as a service, and how it could be improved. Subcommittee members eagerly suggested ideas for how to fill our service gaps. With this buy-in, each team member felt empowered and energized to do the necessary work to improve the service.

Defining Operations and Generating Insights

Service blueprinting can help define the operations of library technology services and generate insights for new improvements. In providing a comprehensive view of a service operation, a blueprint can help teams think about both the front-end public services components of data visualization services as well as the behind-the-scenes systems and support necessary to produce a positive user experience. Once new library technology is in place, there is often a gap in time between users being prepared to engage with the service and the library being prepared to deliver the service. The process of creating a service blueprint can better prepare the library to deliver the service, and to anticipate user pain points so that users can also be best prepared to engage with the service.

Creating a service blueprint is appropriate at any stage of technology service development. A service blueprint can be applied to planned services that have not yet been implemented as a way to anticipate issues before the launch of a service; it can structure service development when a technology service is new; and it can provide new insights about an established service. Furthermore, a blueprint can be created to strategically assess the feasibility of a potential or future service in terms of space and staff capacity. In this way, the assessment from a service blueprint can be used to advocate for new staffing or resources that are shown to be necessary in delivering a new service. Alternatively, the blueprint could be used to justify not moving forward with implementing a new technology service, should the necessary support resources not be available.

In order to capture the evolution of a service, service blueprinting should be an iterative process that is repeated over time. A service blueprint provides a snapshot—a picture of a service at one point in time. The blueprint should therefore be revisited and revised as your service grows and changes. In our case, the orange user actions sticky notes are relatively sparse on our display wall service blueprint (see Figures 2 and 3), since the display wall is still a new service at the MSU Library. As the display wall is used more, the Library and University IT will begin to better understand display wall users, and the user actions section of future service blueprints will become more nuanced and insightful. We will continue to create blueprints periodically throughout the life-cycle of the service so as to maintain up-to-date operations and positive user experiences.

Integrating with Complementary Tools

Service blueprinting is one tool in the service design toolbox. A blueprint can be combined with other tools to provide even deeper analysis and insight of the user experience around a service. Service blueprinting is best suited for defining the operation of a service. The service blueprint is completed internally by library staff—it doesn't collect or represent feedback directly from users. For this reason, a service blueprint can be especially useful when created in conjunction with other design approaches that focus on collecting user data, such as analytics, user interviews, ecology maps, and mobile ethnographies (Schmidt and Etches 2014; Marquez and Downey 2016; Marquez and Downey 2017).

A service blueprint can also be created alongside other mapping tools. The map is a common structure and metaphor for expressing service design processes and outputs (Sun and Park 2017). Other service design maps include empathy maps, experience maps, and journey maps. These mapping tools are different and complementary to each other. Empathy maps focus on a user's mindset with the aim of developing empathic understandings of user emotions and subjective experiences. Experience maps can be used to visualize the full scope of a user's experience while accomplishing a goal. In contrast to the service blueprint, the experience map is not tied to a single service, but rather to a single user goal, which may encompass multiple services. Journey maps are visual representations of the flow through a service taken by a user, and—in contrast to the service blueprint—journey maps are created with user input and collaboration. For this reason, journey maps are an especially useful complement to the service blueprint, since a combination of the service blueprint and the journey map demonstrates an internal view of a service compared with a user's actual experience of the service (Gibbons, 2017)

In sum, service blueprinting should not replace existing tools and techniques for assessing services and evaluating user experiences. Rather, service blueprinting can integrate with other design and assessment approaches, and can be applied in concert to provide a detailed and comprehensive understanding of users' experience of a service.

Conclusion

Designing and assessing technology services can present challenges for libraries. Service blueprinting can help. As a method for designing and assessing services, the service blueprint is a flexible tool that can be used to provide insight and understanding for the operation of a service. At the MSU Library, creating a blueprint for our new display wall helped us better

understand its operation and integration with existing spaces and services. The service blueprint can deepen our understanding of our services, and in concert with other design and assessment tools, can be used to assess and improve our users' experience. Ultimately, we found the service blueprint to be a useful tool that can be applied to assess and improve library technology services.

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Disclosure

The authors report no conflict of interest.

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