Hackathons and Libraries

The Evolving Landscape 2014–2020

Meris Mandernach Longmeier

ABSTRACT

Libraries foster a thriving campus culture and function as "third space," not directly tied to a discipline.[1] Libraries support both formal and informal learning, have multipurpose spaces, and serve as a connection point for their communities. For these reasons, they are an ideal location for events, such as hackathons, that align with library priorities of outreach, data and information literacy, and engagement focused on social good. Hackathon planners could find likely partners in either academic or public libraries as their physical spaces accommodate public outreach events and many are already providing similar services, such as makerspaces. Libraries can act solely as a host for events or they can embed in the planning process by building community partnerships, developing themes for the event, or harnessing the expertise already present in the library staff. This article, focusing on years from 2014 to 2020, will highlight the history and evolution of hackathons in libraries as outreach events and as a focus for using library materials, data, workflows, and content.

INTRODUCTION

As a means of introduction to hackathons for those unfamiliar with these events, the following definition was developed after reviewing the literature. Hackathons are time-bound events where participants gather to build technology projects, learn from each other and experts, and create innovative solutions that are often judged for prizes. While hacking can have negative connotations when it comes to security vulnerabilities, typically for hackathon events hacking refers to modifying original lines of code or devices with the intent of creating a workable prototype or product. Events may have a specific theme (use of a particular dataset or project based on a designated platform) or may be open-ended with challenges focused on innovation or social good. While hackathons have been a staple in software and hardware design for decades, the first hackathons with a library focus were sponsored by vendors, focused on topics such as accessibility and adaptive technology for their content and platforms.[2] Other industry hackathons focused on re-envisioning the role of the book in 2013 and 2014.[3]

As hackathons became more popular at colleges and universities, library participation evolved from content provider to event host. These partnerships were beneficial to libraries interested in shifting the perception of libraries from books to newer areas of expertise around data and information literacy. However, many libraries realized that by partnering in planning the events greater possibilities existed to educate participants about library content and staff expertise. Some examples include working with public library communities to highlight text as data, having academic subject librarians work with departmental faculty to embed events within curriculum and assignments, and for both academic and public libraries to promote library-produced and publicly available datasets.[4]

Meris Mandernach Longmeier (longmeier.10@osu.edu) is Head of Research Services, The Ohio State University Libraries. © 2021.

There are many roles that libraries can take in these events. Libraries can act as event hosts where they provide the space at a cost or for free.[5] In other cases, library staff become collaborators and in addition to space may assist with planning logistics, judging, building partnerships, and have some staff present at the events.[6] In public libraries this often includes building relationships with the city or specific segments of the community based on the theme of the event. On college campuses, it may be a partnership with a specific disciplines or campus IT or an outside sponsor. In this way, the libraries are building and sustaining the event due to aligned priorities with the other partners. Another option would be for the library to be the primary sponsor, where the library may provide prizes, the theme for the hackathon, as well as many of the items listed above.[7] However, instead of specific categories, it should be viewed as a continuum of partnership and the amount of involvement with the event should align with the library's priorities of what it hopes to accomplish through the event. How involved in event planning specific libraries want to be may depend on the depth of the existing partnerships as well as how many resources the library wants to commit to the event.

Libraries have always existed as curators and distributors of knowledge. Some libraries are using hackathons to advance both their image and their practices. Libraries are evolving into new roles and have grown to support more creative endeavors, such as the maker movement. This shift of libraries from book-provider to social facilitator and information co-creator aligns with hackathon events. The physical spaces themselves are ideal to support public outreach events and libraries are already providing makerspaces or similar services that would overlap with a hackathon audience.[8] Additionally, the spaces afforded by libraries allow flexibility and creativity to flourish, ideas to be exchanged, and different disciplines to mingle and co-produce. Library staff focused on software development may have projects that would benefit from outside perspectives as well.

In recent years libraries have become stewards of digital collections that can be used and reused in innovative ways. Many libraries have chosen Wikipedia edit-a-thons as a means of engaging with the public and enhancing access to materials.[9] Similarly, the collections-as-data movement is blossoming and allowing galleries, libraries, archives, and museum (GLAM) institutions to rethink the possible ways of interacting with collections. Many public libraries are partnering with local or regional governments to build awareness of data sources and build bridges with the community around how they would like to interact with the data.[10] Additionally, as data science continues to grow in importance in both public and academic libraries, data fluency, data cleaning, and data visualization could be themes for a hackathon or data-thon.[11]

For those unfamiliar with these events, table 1 provides some generalized definitions created by the author of the different types of events and their intended purpose. For some organizations, there are ways to support these events that consume fewer resources or require less technical knowledge, such as an edit-a-thons or code jams.

Table 1. Defining common hackathon and hackathon-like events, purpose, and typical size of events

Type of event	Definition	Purpose	Size of event
Hackathon	A team-based sprint-like event focused on hardware or software that brings together programmers, graphic designers, interface designers, project managers or domain experts; can be open ended idea generation or for a specific provided theme	Build a working prototype, typically software	Up to 1,000 participants, usually determined by space available
Idea Fest	Business pitch competition where individuals or teams pitch a solution or new company (startup) idea to a panel of judges	Deliver an elevator pitch for an idea, could be to secure funding	<100
Coding Contest or Code Jam	An individual or team competition to work through algorithmic puzzles or on specific code provided	Learning to code or solve challenges through coding; may produce a pitch at the end rather than a product	20–50
Edit-a-thon	An event where users improve content in a specific online community; can focus on a theme (art, country, city) or type of material (map)	Improving information in online communities such as Wikipedia, OpenStreetMap, or LocalWiki	20–100
Datathon	A data-science–focused event where participants are given a dataset and a limited amount of time to test, build, and explore solutions	Usually a visualization or software development around a particular dataset	50–100
Makeathon	Hardware focused hackathon	Build working prototype of hardware	Up to 300 participants

METHODS

To find articles in the library and information science literature related to hackathons and libraries, the author searched the Association for Computing Machinery (ACM) Digital Library, Scopus, Library Literature and Information Science, and Library and Information Science and Technology Abstracts (LISTA) databases. In Scopus and the ACM Digital Library, the most successful searches included the following: (hackathon* OR makeathon*) and library; in Library Literature and Information Science and LISTA databases, the most successful searches included:

hackathon OR makeathon OR "coding contest." The author also searched Google Scholar in an attempt to locate other studies or reports, some of which came from institutional repositories. While this search strategy was not meant to be exhaustive, it uncovered many articles about hackathons and libraries and others were found by chaining citations in the articles reference lists. Based on search locales, international articles were found but only those where the text was available in English were included which meant that articles from Asia, Africa, and the Global South may have been inadvertently overlooked. Only two of the articles found in the search results were not held in library locations, did not use library/archival materials, or were not an outreach event where library staff were integral in planning (these were discarded.)

FINDINGS

The author grouped the literature into two categories: library as place and library as source. In the realm of library as place, the literature consisted of reporting on hackathons where the library was the host location for the event, those where the hackathon was an outreach event, and those where the hackathon was an extension of the libraries' teaching/education mission. For most of these articles the majority were case studies and often shared tips for other libraries to consider when hosting a hackathon in library spaces.

The second category, those that use library as source, focused on highlighting library spaces or services, workflows, or collections as the theme of the events. Additionally, there were a few articles in the second category that discussed how to prepare or clean library data or library sources before the event to ensure that participants were able to use the materials during the time-bound event. In some cases where the source materials were from the libraries, the event also occurred in the library; thus, some articles fit into both categories and are highlighted in both sections.

Results: Library as Place
The following summaries of hackathons and libraries as places for events will be grouped into two subgenres: library spaces and outreach events. Libraries, both public and academic, are ideal locations for hosting large, technology-driven events given the usual amenities of ample parking, ubiquitous Wi-Fi, adequate outlets, and at times already having 24-hour spaces built into their infrastructure. More and more libraries are offering generous food and drink policies, a benefit as sustenance is a mainstay at these multiday events. Additionally, libraries already host a number of outreach events and serve as a community information hub.

Using Libraries as Event Hosts for Hackathons
A number of articles detail the use of library spaces to host hackathon events.[12] The University of Michigan Library, a local hackerspace (All Hands Active), and the Ann Arbor District Library teamed up to host a hackathon focused on Oculus Rift.[13] This event grew out of a larger partnership with the community and sought to mix teams to include participants from all three areas. The 2018 article by Demeter et al. highlights lessons learned from Florida State University Library and many of the planning steps involved when hosting large outreach events in library spaces.[14] While the library initially hosted a 36-hour event, HackFSU, as a favor to the provost in the first year, they continue to host the event, providing library staff as mentors and logistical support. After the first year they started charging the student organization for use of the space and direct staffing costs for the hours beyond normal operating hours. While focused primarily on providing a central campus space, the library also sees it as a way to highlight the teaching and learning role of the library. Similarly, Nandi and Mandernach detail the steps involved in planning

hackathon events and some benefits of choosing the library as a location for the event.[15] At Ohio State, hackathon events in 2014 and 2015 were held in the library due to twenty-four-hour spaces, interest by the libraries in supporting innovative endeavors on campus, and a participant size (100–200 attendees) that could be accommodated in the space. Other events chose academic libraries as locations for hackathons due to their central location on campus.[16] An initial summary of library hackathons was captured by R. C. Davis who detailed that libraries may be motivated to host such events as they align with library principles of "community, innovation, and outreach."[17] She points out that libraries are ideal locations because of small modular workspaces paired with a large space for final presentations. Additionally, adequate and sufficiently strong Wi-Fi or hard-wired connections, a multitude of power outlets, and 24-hour spaces are appealing for these kinds of events. Event planners should know that the necessities include free food and multidisciplinary involvement. Davis details ways to plan smaller events, such as code days or edit-a-thons, if staffing does not allow for a large hackathon event. In all cases, the libraries serve a purpose to either campus or community as the location and sometimes also provide staff for the events.

Hackathons as Library Outreach
Hackathon events are a great way to reach out to the community and provide a fresh look into libraries as purveyors of information focused on more than books. At the 2014 Computers in Libraries conference, Chief Library Officer Mary Lee Kennedy delivered a keynote sharing stories of the New York Public Libraries experiences hosting Wikipedia editathons and other hackathons at various branches since 2014.[18] The goals for these outreach events were to highlight strategic priorities around making knowledge accessible, re-examine the library purpose, and spark connections. Early library hackathon events focused on outreach included topics of accessibility or designing library mobile apps.[19] More recent events have focused on outreach but with an eye toward sharing content as part of the coding contest.[20] Even library associations have hosted pre-conference hacking events to highlight what libraries are doing to foster innovation.[21]

The Future Libraries Product Forge, a four-day event, was hosted in collaboration with the Scottish Library and Information Council and delivered by Product Forge, a company focused on running hackathons that tackle challenging social issues. The 2016 event focused specifically on public libraries in Scotland and seven teams, comprised mainly of students from a local university, worked with public library staff and users as well as regional experts in technology, design, and business.[22] The goals of the event were to raise awareness of digital innovation with library services, generate enthusiasm for approaches to digital service design, and codesign new services around digital ventures. Participants created novel products including digital signage, a game for young readers, a tool for collecting user stories about library services, and an app to reserve specific library spaces.

Another common focus for library hackathon outreach events is the theme of data and data literacy. In July 2016, the Los Angeles Public Library hosted the Civic Information Lab's Immigration Hackathon.[23] This outreach event gathered 100 participants to address local issues around immigration. The library, motivated by establishing itself as a "welcoming, trusting environment," wanted to be a "prominent destination of immigrant and life-enrichment information and programs and services."[24] Newcastle libraries ran two-day-long events focused on promoting data they released under an open license as part of the Commons are Forever project.[25] They used both events to educate users about tools such as GitHub, a GIF-making session with historical photographs, and data visualization tools. Similarly, Toronto Public Library hosted a series of open data hackathons to highlight the role of the libraries in civic issue

discourse, data literacy, and data education.[26] Their events combined the hackathon with other panel presentations and resources focused on mentorship and connection-building in the technology sector. The library also used the event to promote their open data policy, build awareness around the data provided by the library for the community, and highlight their role in facilitating conversations around civic issues through data literacy and data education.

Edmonton Public Library hosted its first hackathon in 2014 for International Open Data Day. One of the main drivers was to build the relationship with their local government.[27] They built their event around the tenets laid out in the Open Data Hackathon How-to Guide and by a blog post about the City of Vancouver's 2013 International Open Data Day Hackathon.[28] They took a structured approach to documenting expectations of both partners around areas such as resources, staffing, and costs, which served as a roadmap for the hackathon and the partnership. The library provided the event space, coffee and pizza, an emcee, tech help and Wi-Fi, door prizes and "best idea" prize, and promotional material. The city recruited participants and provided an orientation, promotional banners, and a keynote. The event led to a deeper partnership with the city and additional hacking events. In these ways, the hackathon served a greater purpose of community building and awareness around data, the role the library plays in interpreting data, and how the libraries serve as a resource hub to the community.

Events Supporting Library Teaching Mission
At academic institutions, the events often focus on outreach to their own campus community. In 2015, Adelphi University hosted their first hackathon and the libraries funded the event themselves rather than seeking outside funding.[29] The article details the considerable lessons learned through the process as well as a step-by-step guide to planning a smaller event. Similarly, York University Science and Engineering Library hosted hackfests in the library and embedded an event as part of an introductory computer science course.[30] Shujah highlighted some of the benefits to the library hosting a hackathon included: establishing libraries as part of the research landscape, providing a constructive space for innovation and innate collaborative environment, highlighting the commitment to openness and democratizing knowledge, and acknowledging the library's role in boosting critical thinking and information literacy concepts. Shin, Vela, and Evans highlight a community hackathon at Washington State University College of Medicine where a group of librarians from multiple institutions staffed a research station throughout the event.[31] While the station was underutilized by participants, as only seven questions were asked during the event, the libraries deemed their participation a success as it worked as an outreach and promotion mechanism for both library services and expertise.

At some public libraries, the focus of the hackathon is on education and teaching basic coding skills. Whether called a coding contest, hackathon, or tech sandbox, there are opportunities for programming with a focus on learning and skill-building and fun.[32] Santa Clara County Library district used a peer-to-peer approach for mentoring and hosted a hackathon in 2015 for middle- and high-school students.[33] The library staff facilitated the event planning and recruited judges from the community, but the bulk of the event was coordinated by the students.

Considerations When Hosting Events in Library Spaces
A couple of substantive reports provide overarching recommendations and considerations for hosting hackathons in library spaces, including planning checklists, tips on getting funding, building partnerships with local community officials, and thinking through the event systematically. Recently, the Digital Public Library of America (DPLA) created a hackathon

planning guide that details a number of logistical issues to address during the planning phases, both pre- and post-event.[34] This report highlights specific considerations for galleries, libraries, archives and museums that are looking to host a hackathon. After hosting a successful hackathon, librarians at New York University created a LibGuide called Hack Your Library which is a planning guide for other libraries considering hosting a similar event.[35] The *Engage Respond Innovate Final Report: The Value of Hackathons in Public Libraries* was put together following an event the Carnegie UK Trust sponsored.[36] This guide highlights some of the challenges present with hackathons, including: intellectual property of the creations, prizes, participant diversity, and complications that arise from either approach of using specific themes or open-ended challenges. It also highlights some of the main reasons a library should consider hackathons and other coding events, including ways to promote new roles of libraries within communities, promote specific collections, capitalize on community expertise, gain insight about users, help users build new skills and improve digital literacy, and develop tools that increase access to materials. Finally, the report points out that hosting an event will not be the only solution for a library's innovation problem. Yet if the library is clear on why it wants to hold a hackathon, being planful about expectations and outcomes the library is trying to achieve will increase the chances for success.

Results: Library as Source
The other category of articles about hackathons and libraries focuses on the library as the source for the challenge or theme of the hackathon. The following summaries highlight articles include those where the libraries provided the challenges around library spaces or services, library datasets, workflows or collections as the theme for the hackathon. This section also details steps involved in cleaning data for use/re-use in time-bound events.

Using Hackathons to Improve Library Services and Spaces
A few articles discuss libraries that proposed hackathon themes around improving library services. A 2016 article describes how Adelphi University Libraries hosted a hackathon and provided the theme of developing library mobile apps and web software applications.[37] The winning student team created an app for library group study meetups. Similarly, the librarians from University of Illinois tried three approaches for library app development: a student competition, a project in a computer science course, and a coding camp. With the adventure code camp, students co-designed with librarians over the course of two days.[38] They advertised to specific departments and courses and ten students were selected with six ultimately participating in the two-day coding camp. Students were sent a package of library data, available APIs, and brief tutorials on coding languages that may be useful. Mentors and coaches were available throughout the coding camp. The authors provided tips for others trying to replicate their approach as well as insights from the students about interest in developing apps that include library data but that don't solely focus on library services. The following year the librarians hosted a coding contest focused specifically on app development related to library services and spaces.[39] The library sponsored the event and served as both a traditional client and partner in the design process. Ultimately six teams with a total of 26 individuals participated and each app was "required to address student needs for discovery of and access to information about library services, collections, and/or facilities" but not duplicate existing library mobile apps. They based their approach on Massachusetts Institute of Technology's entrepreneurship competition. Through this process, co-ownership was preferred and many teams set up a licensing agreement as part of the competition to handle intellectual property for the software. Students had two weeks to complete the apps and were judged by both library and campus IT administration. This article details what

they learned through the process given the amount of attrition from selection of teams to final product presentations.

The New York University School of Engineering worked with the libraries and used a hackathon theme of noise issues to coincide with the renovation of the library.[40] The libraries created a LibGuide to provide structured information about the event itself (https://guides.nyu.edu/hackdibner). They used the event to market the new maker space and held workshops there leading up to the event. In the inaugural year they held the event over the course of two semesters and saw a lot of attrition due to the event length. In the second year, following focus groups with participants, they designed a library hackathon with four goals: 1) appeal to a large base of the student population, 2) create a triangle of engagement between the student and the library, the library and the faculty, and the faculty and the students, 3) provide an adaptable model to other libraries, and 4) highlight the development of student information literacy skills.[41] The second year's approach required more work by the participants due to pitching an initial concept, providing a written proposal, and giving a final presentation. Library staff and guest speakers offered workshops to help students hone their skills. The planners evaluated the event through surveys and student focus groups. Overall the students applied what they learned about information literacy and were highly engaged with the codesign approach to library service improvements.

Similarly, McGowan highlights two hackathons at Purdue that focused on inclusive healthcare and how the libraries applied design thinking processes as part of the events.[42] The librarian wanted to encourage health sciences students to examine health data challenges. To examine this issue, she applied the Blended Librarians Adapted Addie Model (BLAAM) as a guide to developing a service to prepare students to participate in a hackathon. A number of pre-event training sessions were held in the libraries and covered topics such as research data management, OpenRefine and data cleaning, Gephi for data visualization, and JavaScript. While this initial approach was in tandem with the hackathon events, students reported that they needed assistance in finding and cleaning datasets for use. In this case, developing library services to prepare for hackathon events ended up out of alignment with both the library's mission and the participants' expectations.

Using Library Materials for Hackathon Themes
Several events have focused on library as source where the library's materials or processes serve as the theme of the hackathon, particularly around digital humanities (DH) topics.[43] In September 2016, over 100 participants worked with materials from the special collections of Hamburg State and University Library, a space that serves both the university and the public.[44] It followed the process established by Coding Da Vinci (https://codingdavinci.de/en), an event that occurred in 2014 and 2015. The event at Hamburg State and University Library had a kick-off day for sharing available datasets, brainstorming projects using library materials, and team building opportunities. The event had a second day of programming and then teams had six weeks to complete their projects. Some exemplary products included a sticker printer that would print old photographs, a quiz app based on engraving plates, and using a social media platform to bring the engravings to the public. The event was successful and resulted in opening additional data from the institution.

Several examples focus on highlighting digital humanities approaches as part of the events. In 2016, four teams from across European institutions participated over five days in Kibbutz Lotan in the Arava region of Israel to develop linguistic tools for Tibetan Buddhist studies with the goal of

revealing their collections to the public.[45] The planning team recruited international scholars to participate in prestructured teams (teams consisted of computer scientists as well as a Tibetan scholar) in Israel. Although it was less of a traditional hackathon, this event being more akin to an event/coding contest around a specific task, it highlighted tools and methods for understanding literary texts. The format of the event for encouraging interdisciplinary efforts in the computational humanities was deemed successful and it was repeated the next year on manuscripts and computer-vision approaches. Recently the University of Waterloo detailed a series of datathons using Archives Unleashed to engage the community in an open-source digital humanities project.[46] The goal of the events was to engage DH practitioners with the web archive analysis tools and attempt to build a web archiving analysis community.

In 2016, the American Museum of Natural History in New York hosted their third annual hackathon event, Hack the Stacks, with more than 100 participants.[47] The event focused on creating innovative solutions for libraries or archives and to "animate, organize, and enable greater access to the increasing body of digitized content." Ten tasks were available for participants to work on and ranged from a unified search interface, reassembling fragments of scientific notebooks, and creating timelines of archival photos of the museum itself. In addition to planning the tasks, the library staff ensured that the databases and applications could handle the additional traffic. A multitude of platforms were provided (Omeka, dSpace, the catalog, APIs, ArchiveSpace, etc) for hackers to use. All prototypes that were developed were open source and deposited on GitHub at "Hack the Stacks."[48]

Some cultural institutions have used hackathons as a means of outreach and publicity and then have showcased the outputs at the museums. Vhacks, a hackathon at the Vatican, was held in 2018 and gathered 24 teams from 30 countries for a 36-hour event.[49] The three themes for the event focused on social inclusion, interfaith dialogue, and migrants and refugees. A winner was announced for each thematic area and sponsors enticed participants to continue working on projects by having a venture capitalist pitch a few weeks after the event. Another program, Museomix, concentrates on a three-day rapid prototyping event where outputs are highlighted in the museum or cultural institution.[50] This event has happened annually in November since 2011 and the goal is to create interdisciplinary networks and encourage innovation and community partnership.

Improving Library Workflows and Processes
Other hackathons have focused on library staff working on library processes themselves. Bergland, Davis, and Traill detail a two-day event, CatDoc Hack Doc, hosted by the University of Minnesota Data Management and Access department focused on increasing documentation by library staff.[51] This article details logistics of preparing for the event as well and a summary of the work completed. They based their approach on the Islandora Collaboration Group's Template on how to run a Hack/Doc.[52] They were pleased with the workflow overall, refined some of the steps, and held it again for library staff the following year. Similarly, Dunsire highlights using a hackathon format to encourage adoption of a cataloging approach of Research Description and Access (RDA) through a "Jane-athon."[53] Events occurred at library conferences or in conjunction with other hackathon events, such as the Thing-athon at Harvard, with the intention of promoting the use of RDA, to help users understand the utility of RDA, and to spark discussions. This approach proved useful in uncovering some limitations with RDA as well as valuable feedback that could be incorporated into its ongoing development.

Considerations When Using Libraries as Source
If libraries are interested in hosting a hackathon where the library plays a more central role, there are several options of ready-to-use library and museum data that could allow the host to also serve as the content provider. The Digital Public Library of America released a hackathon guide, GLAM Hack-in-a-box: a short guide for helping you organize a GLAM hackathon with several sources at the end for finding data related to libraries.[54] The University of Glasgow began a project called the Global History Hackathons that seeks to improve access and excitement around global history research.[55] Additionally, Candela et al. detail the new array of sources for sharing GLAM data for reuse in multiple ways, including using data in hackathon projects.[56] Planners could look to the collections-as-data conversations for other data sources that could be adapted for hackathon projects.[57] When thinking about hackathons and cultural institutions, sustainability of projects and choice of platforms is an important consideration for planners.[58] Ultimately, the top priority when providing a dataset is to ensure that it is clean and enough details about the dataset are available for participants to make use of it in their designs given the time constraints of most events.

DISCUSSION

Hackathons often have a dual purpose of educating the participants and serving as an advertisement for the sponsor for either a platform or content. Participants will develop a working prototype or improving their coding abilities; sponsors, including libraries, can benefit from rapid prototyping and idea generation using either their platforms or content. While usable apps or new ideas are a welcome outcome, even if the applications are not used, the events still feed into the larger goal of marketing libraries and their data, building relationships with local communities, or drawing attention to social good.

There are benefits to libraries in either hosting or collaborating on the events. In both areas, those of library as space and library as source, hackathons help realign user expectations of libraries. If libraries choose to become involved with hackathons or other coding or data contests, the library should be deliberate in its goals and intended outcomes as those will help shape both the event and its planning. Libraries are naturally aligned with teaching and learning, are already offering co-curricular programming, and typically serve as physical and communication hubs for campus. Libraries already prioritize outreach and engagement with constituents both on campuses and in the community. Therefore, when programs align with library priorities of data literacy, data fluency, and information evaluation, it is a natural fit to propose involvement in hosting hackathons. Many libraries are able to customize their spaces, services, and vendor interfaces, which is a benefit when thinking about having libraries as a theme for an event.

Other benefits exist for the hackathon event planners when partnering with a library. Hackathon planners should consider reaching out to libraries as they already serve as a cross-disciplinary event spaces, host many other outreach events, and are often connected to other campus and community stakeholders and communication outlets. Since students from all disciplines and colleges already use the library spaces on college campuses, they are an ideal location for fostering collaborations from different colleges and majors. Public libraries function as community gathering spots as well. As libraries consider hosting events, several articles provide overarching tips for planning and hosting hackathons and other time-bound events.[59] Table 2 provides an overview of articles and the areas of coverage for planning topics.

Table 2. Selected articles for tips on planning hackathon events based on common article theme areas

Article author	Location details	Sample agenda + timelines	Power and computing	Mentors/ judging	Further readings
Carruthers (2014)	X	X	X	X	
Nelson & Kashyap (2014)	X	X	X	X	X
Jansen-Dings, Dijk, van Westen (2017)	X	X			X
Bogdanov & Isaac-Mendard (2016)	X	X		X	
Nandi & Mandernach (2016)	X		X	X	
Grant (2017)	X	X	X	X	X

As library data becomes more open and reusable, hackathons will be a way to highlight data availability, promote its use and reuse, and reach out to the community. The issues present when considering library collections as potential hackathon themes are that libraries will need to ensure the data are cleaned and contain sufficient metadata so that the data are ready to use. Additionally, if there are programming language restrictions for ongoing maintenance by the library after the event, those should be specified when advertising the event. Ultimately, the libraries will likely not control the intellectual property (IP) of the tool or visualization developed, but several libraries have specified the ultimate IP as part of the event details either as open source or co-owned.[60] Often the goal of the event is the promotion of specific materials or building awareness of a collection rather than any biproduct created during the event. However, it is important for the library to be clear about their intent when advertising to participants. The collections-as-data movement will continue to evolve and there will be a multitude of library resources that could be mined for use at hackathons or other similar events.

While libraries provide an ideal location and have access to data that can be used for an event, they can also leverage their wealth of experts. Library staff can serve as judges, mentors, and connectors to the wider campus or community. Events could highlight specific expertise when hackathons focus on particular approaches (data visualization), processes (metadata management or documentation), or codesign of services (physical spaces). Table 3 provides examples of hackathon events from a variety of library contexts.

Hackathons are a great way for libraries to serve as a connector to others on campus or in their communities. If libraries are not interested or able to host an event themselves, library staff can act as mentors or event judges. At smaller schools, library staff can partner with other campus units to plan a hackathon; similarly, smaller public libraries could work with community organizations to host events. At a smaller scale if staffing is a concern or full hackathons are unrealistic, a coding contest or datathon, both of which typically have a shorter duration, might be an option. Edit-a-thons are even easier to host as they require only an introduction to the editing process, ample computer space (or laptop hook-ups), and a small food budget. Some edit-a-thon events happen in a single afternoon.

Table 3. Selected hackathon event summaries from various library contexts based on themes and products of the event

Article author	Type of library	Size of event	Time for event	Purpose of event	Role of the library	Output
Carruthers (2014)	Public + city	29 participants	1 day	Highlight open data from the libraries	Event space, coffee + pizza, emcee, some prizes, assessment	Building partnerships with the city, getting dataset requests
Ward, Hahn, Mestre (2015)	Academic	6 teams; 25 participants	2 weeks	Develop apps using library data	Event sponsor, mentor	App development for library using library data
Mititelu & Grosu (2016)	Academic	100 participants	48 hours	Bring together tech students	Event space	App development for sponsors
Nandi & Mandernach (2016)	Academic	200 participants	36 hours	Bring together tech students	Event space, planning logistics, judges	Various apps, not library related
Baione (2017)	Private museum	100 participants	2 days	Animate, organize, and enable greater access to digitized content from the library	Create challenges, event space, judges	Open source apps for GLAM institutions
Theise (2017)	Academic + public	100 participants	2 days + 6 week sprint	Cultural hackathon to highlight library data and resources	Event space, challenges, datasets for hacking	Highlighted data available for use, created apps focused on library materials
Almogi et al. (2019)	Academic	23 participants	5 days	Develop linguistic tools for Buddhist studies	Provided cleaned datasets for manipulation	Linguistic tools for Buddhist studies

One area for iteration around these events relates to timing. While most hackathons last 24–36 hours, some are run over the course of a one- or two-month period where coding happens

remotely with a few scheduled check-ins with mentors before judging and presentations. This notion of a remote event may have more appeal for collections-as-data–themed events as experts are more likely to be available for keynotes or mentoring. If the process instead of the product is the focus of the event, then providing a flexible structure may be more appealing to participants. If a library has more limited resources or capacity, stretching the event out over a longer period would allow for sustained interactions. However, libraries should be aware that the longer the event period, the greater the attrition of the participants.

An area for future research includes assessment of library participation in events. A couple of articles highlighted the value the libraries found in the events, but it is unclear whether the participants also gained value from the libraries.[61] Typically, post-event surveys have focused on the participant experience or the overall event space, rather than whether it affected participants' view of the libraries, which would another area of interest for future research.[62]

CONCLUSION

In the realm of hackathons and libraries, originally hackathon themes were a way that vendors could highlight new content or improve interfaces. Libraries followed this trend and used events to reach out to constituents, make connections with their communities, and highlight evolving library services. With the growth of flexible spaces, ample technology support and more relaxed food policies, libraries have become ideal event locations. As the collections-as-data movement evolves, there will be more opportunities to develop services related to these data and other library data which would lend themselves easily as themes for hackathons, edit-a-thons, or datathons.

Libraries thinking about hosting events will need to weigh the amount of time and resources they want to invest with the intended goals of hosting an event. Planning is essential whether the library is the event host, a collaborator, or a sponsor of a hackathon. For those libraries that are unable to host a full hackathon, smaller events, such as a datathon or edit-a-thon, are possibilities to provide support without the same time and resource commitment. Given the growing popularity of hackathons and other coding contests, they may be a catch-all for solving several library issues simultaneously: updating the library's image as being more than book-centric, supporting the collections-as-data movement, and a new way of engaging community partners.

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