Community-Led Digital Exhibits Service at the Edmonton Public Library: Research and Consultation

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Abstract

This paper presents the findings of the community consultation and research conducted as part of the Digital Exhibits Intern Librarian Project at the Edmonton Public Library in 2016. The research project aimed to understand the local context for a new technology service in Edmonton, including the capacity for content creation and partnership among community organizations aligned with the Library's mission. The study consisted of a survey and a series of semi-structured interviews. Findings include identification of various audiences and topics for digital projects, prioritization of Library and community partner roles in digital project collaborations, and identification of major components of digital exhibits as areas of project management workflows.

Introduction

The prevalence of digital displays is clearly evident in commercial spaces around the world, such as shopping malls (e.g. SAGA Shopping Mall in Xi'an, China), banks (e.g. ANZ Bank Martin Place Branch in Sydney, Australia), sporting arenas, and corporate offices. Such technologies are also becoming more commonly used in high-traffic public spaces, such as transit centers, university campuses, and city squares. In the majority of cases, such technologies offer little to no interaction with their users, functioning

simply as signage vehicles for informational content. More recently, digital displays have also emerged in North American academic environments, including North Carolina State University Libraries, Brown University Libraries, Georgia State University Libraries, University of North Carolina at Chapel Hill Libraries, and the University of Oregon's Alumni Center. Their uses in university contexts have included signage, scholarly communication, instruction, public tours, student work showcase, artistic expression, entertainment, and social media campaigns.

In 2020, the Stanley A. Milner Library, the central branch of the Edmonton Public Library (located in Edmonton, Alberta, Canada) will reopen after extensive renovations to both the interior and exterior of the building. Major renovations are an opportunity to expand spaces and services. As part of the interior renovations, the Edmonton Public Library (EPL) plans to install a large-scale digital interactive display wall, modeled after Queensland University of Technology's The Cube located in Brisbane, Australia. The function of this particular digital installation—as a learning space and literacy tool—aligns with EPL's core mission of supporting digital literacy. As a result, EPL's leadership has identified this unique digital display as a tool for community engagement and lifelong learning. Offering such technologies to the public free of charge demonstrates commitment to lowering barriers to access to technology, building comfort with emergent technologies, encouraging social engagement among customers, and continuing to extend the notion of a digital public space. Curating and sharing content that is relevant to the local community using this technology is also part of the strategy to engage community organizations in working collaboratively to serve the needs of Edmontonians. The physical scale of such displays, combined with their underlying audio-visual capabilities, also open up possibilities for creation and sharing of artistic forms of expression for multi-user audiences. In other words, the capacity to offer learning opportunities for multiple library patrons at once strengthens the library's position as a community-oriented public space, facilitating interaction through the digital experience between library customers, and with library staff. In order to prepare for the launch of a new technology service, EPL hired a Digital Exhibits Intern Librarian in 2016 whose role included conducting research to inform the Library in achieving the vision for the Stanley A. Milner Library Digital Display Wall serving as a shared community platform for all manner of digitally accessible and interactive exhibits. In addition to the community consultation discussed in this paper, the author also carried out an environmental scan and literature review related to digital displays.

Since the proliferation of digitization initiatives in libraries, archives, and museums, the term digital exhibits may refer to curated digital projects for research, educational, or recreational purposes. These projects often bring together various digitized material, such as books, posters, correspondence, drawings, personal papers, or physical objects, around a specific topic, such as local history, social issues, notable individuals, or other themes. To date the term has been specifically used in special collections and digital archives in research institutions, such as the Indiana University Bloomington Libraries, University of California Santa Cruz Library, Washington State University, Utah State University Libraries, York University Libraries, and McGill University Library. Similarly, the term has appeared in public libraries, such as the Windsor Public Library, Chattanooga Public Library, and Newton County Public Library (Oregon, United States).

Hillsboro Public Library (Illinois, United States), for example, refers to its Digital Exhibits as "a collection of digital archives about people, places, and periods in Illinois" (n.d.). Notably, all uses of this term have been in reference to web-based collections.

With the appearance of digital displays that encourage interactive browsing of digital content in Nashville Public Library (Tennessee, United States) and Henrico County Public Library (Virginia, United States), for example, there are some indications that public libraries are pursuing services of this nature across North America. In other words, the term digital exhibits may soon be redefined to mean unique digital media experiences designed for a variety of interfaces, including desktop computers, personal mobile devices, and public displays. Arguably, as adoption of digital displays as new information interfaces grows in public and academic libraries, the concept of digital exhibits may also refer to interactive, immersive learning game-like experiences rather than websites organizing digital information objects. Through research and community consultation, the goal of this research project was therefore to reach a better understanding of this emergent "exhibits" service in the public library context. While such services are still new to libraries, this paper aims to share generalizable practices as gathered within a local context of a major urban public library system in North America.

Method

Due to the exploratory nature of this paper, a qualitative approach was adopted with two major research components. The first component was the circulation of a survey among community organizations already engaged in varying degrees of interactive exhibits services. The survey solicited data regarding the needs and interests of these organizations relevant to the use of a digital interactive display wall. A list of organizations was collected by the Digital Exhibits Intern Librarian in collaboration with EPL's community librarians, the manager of Digital Literacy and Web Services, and by asking survey participants to suggest contacts at other community organizations. The survey was administered digitally using FluidSurveys. Data were collected between September 12 and November 7, 2016. A copy of the survey is included in Appendix A of this paper. Overall, the survey received 58 responses, with 42 unique organizations represented.

The second component of the study consisted of 24 semi-structured interviews with community groups to build a deeper understanding of issues emerging in the survey data. Interview participants included organizational representatives who expressed interest in working on a project with the Library in the near future, those who wished to share comments further to the survey, as well as community members identified by Edmonton Public Library community librarian as well as managers of library branches and various departments to possess information, contacts, or resources relevant to the Digital Exhibits Research Project. Participants were contacted by email and interviewed in person or over the phone. Interview data were collected between November 1, 2016 and February 10, 2017. A complete list of participating organizations for both the survey and semi-structured interviews is included in the Appendix B.

As the community consultation process was a significant focus of the Digital Exhibits Internship, collecting qualitative data through in-person interviews was deemed to be an effective method for this portion of the research project. In general, participants were asked questions that sought advice on best practices in terms of exhibit planning, design, and execution, including the following:

1. What steps might we consider when creating an exhibit?
2. Can you recommend a resource or an expert to help us understand the interactive exhibit design process?
3. Is there a particular domain to gather best practices related to exhibit design?
4. What grants currently exist to support this type of service?

Literature Review

Interactivity

The area of interactivity with public displays has been studied in the Human-Computer Interaction field of Computing Science, though little research has been conducted on this topic in Library and Information Studies specifically. Three major modes of interaction are proposed by the author based on the review of literature on the topic. These include touch, gesture, and remote modes, which are outlined in more detail below.

Touch (or multi-touch): This is the most common way users interact with personal mobile devices such as smartphones and tablets. Multi-touch interaction on public displays should support many individuals interacting with the digital screen simultaneously, since many users expect immediate access and will not take turns. For example, some technologies support up to 30 touch points at any given time, while others, like QUT's The Cube, allow for a near infinite number of touch points. Though studies show that this technique is fast and natural, it also requires additional physical effort from the user (Parra, 2014; Kurdyukova, Obaid & Andre, 2012; Ning et al., 2011). While touch interaction using infrared sensors has the high touch recognition rate, its shortcomings have been identified as being expensive and being influenced by light interference, such as light around the touch screen (Lee, Moon, Lee & Yoon, 2015).

Gesture: This is interaction through movement of the user's hands, arms or entire body, recognized by sensors like Kinect or Leap motion systems. Although studies show that this type of interaction is quick and intuitive, it also brings "a cognitive load to the users together with the increased concern of performing gestures in public spaces" (Parra, 2014, p.181). Specifically, body gestures were found not to be well suited to passing-by interaction, unlike hand gestures, which can be performed while walking. Hand gestures also have an acceptable mental, physical and temporal workload (Parra, 2014; Walter, Gailly & Muller, 2013). Research into gesture-based interaction shows that "more movement can negatively influence recall" and is therefore not suited for informational exhibits (Panhey, Doring, Schneegass, Wenig & Alt, 2015, p. 103). Similarly, people consider gestures to be too much work "when they require two hands and large movements" to execute (Ackad, Clayphan, Tomitsch & Kay, 2015, p.1228). Not

surprisingly, research suggests that gestures deemed to be socially acceptable for public spaces are small, unobtrusive and those that mimic everyday actions. They are also more likely to be adopted by real-world users.

Remote: This mode consists of interaction using an external device, such as a mobile phone, tablet, virtual reality headset, game controller, and other special devices. Connection protocols may include Bluetooth, SMS messaging, near field recognition, radio frequency identification, wireless network connectivity, and other methods. Mobile-based interaction with public displays has received a lot of attention in research, media, and commercial environments because this mode allows users to interact from any distance with minimal physical effort. However, users often find this technique "too technical and inconvenient" (Parra, 2014, p.181; Kurdyukova, Obaid & Andre, 2012) because it requires sophisticated levels of digital literacy in addition to having access to a device. Some suggest that using personal devices for input also helps "avoid occlusion and offers interaction at a distance" without requiring multi-touch or gesture-based interactions (Vepsalainen et al., p. 40). Further, subjects in studies on mobile interaction often indicate their preference for this mode because of its low mental effort and low physical demand. However, it is possible that these studies focused on users with high degrees of digital literacies rather than the general public with varying degrees of access to and comfort with mobile technologies.

User Engagement

Attracting user attention is not necessarily guaranteed by virtue of having a public display. According to research, factors that significantly contribute to user engagement with public displays include display content and social context.

1. Display content

Studies on engagement in public digital display environments indicate that both passive and active types of engagement exist with digital displays. As well, the role of emotion in the content displayed cannot be overlooked. Specifically Clinch, Davies, Friday & Efstratiou (2011) state that people typically pay attention to displays "only when they expected the content to be of interest to them" and that they are "more likely to expect interesting content in a university context rather than within commercial premises" (p. 9). In other words, the context in which the display is situated affects user expectations and primes them for interaction.

In terms of precise measures of attention to such displays, studies of average attention time correlate age with responsiveness to digital signage, with children (1-14 years) being most receptive than adults and with men spending more time observing digital signage than women (Clinch et al., 2011). Studies also indicate a significantly higher average attention times for observing dynamic content as compared to static content (Ravnik & Solina, 2013). Scholars like Buerger suggest that designers of applications for public digital displays should assume that viewers are not willing "to spend more than a few seconds to determine whether a display is of interest" (2011, n.p.). Instead, they recommend to present informational content in such a way that the most important

information can be determined in 2-3 seconds and avoid using more than minimal text. In a museum context, the average interaction time with the digital display was between 2-5 minutes, which was also the average amount of time people spent exploring analogue exhibits (Screven, 2000). In other words, dynamic game-like exhibits at the Cube incorporate all of the above findings to make interaction interesting, fairly short and drawing attention of children first.

2. Social context

Factors such as age and gender seem to influence user attention to public displays. For example, Heinrichs (2008) found that children were the first to engage in interaction with public displays and would often recruit adults accompanying them toward the installation. On the other hand, the researcher found adults to be more hesitant in approaching the installation: "they would often look at it from a distance before deciding to explore it further" (Heinrichs, 2008). Similarly, age has been correlated with anxiety related to using a computer to perform information tasks but not demonstrated performance of the tasks (Laguna & Babcock, 1997). In addition, women are more likely to notice public displays than men (Kukka et al, 2013), though women may prefer different content and functionality in public displays than men (Ojala et al, 2012).

Several scholars have also observed the *honeypot effect* as related to interaction with digital displays in public settings (Brignull & Rogers, 2003; Peltonen et al., 2008; Muller, Alt, Michelis & Schmidt, 2010; Marshall et al., 2011; Michelis & Muller, 2011; Wouters et al., 2016). This effect describes how users who are actively engaged with the display perform two important functions: enticing passers-by to become actively engaged users themselves and demonstrating how to interact with the technology without formal instruction. In other words, users interacting with the display draw attention to the technology and teach others how to use it by actively engaging with the display.

Some researchers argue that a conductive social context can "overcome a poor physical space, but an inappropriate social context can inhibit interaction" even in physical spaces where engagement with the technology is encouraged (Parra, 2014, p. 181). This finding also relates to the use of gestures on public displays (Wouters, Downs, Carter & Moere, 2015). Scholars also found that contextual social factors such as age and being around others in a public setting do, in fact, influence the choice of multi-touch gestures. They suggest enabling a variety of gestures for each action (e.g., different hand postures, number of touch points and hands) to support "fluid gesture sequences and social interactions" (Hinrichs, 2011, n.p.). A major deterrent to users interacting with large public displays has been identified as the potential for social embarrassment (Tang et al., 2008). As an implication, the authors suggest positioning the display along thoroughfares of traffic and improving the ways in which the interaction principles of the display are communicated implicitly to bystanders (Peltonen et al., 2008), thus continually instructing new users on techniques of interaction.

Survey Findings

Types of audiences

Survey participants were primarily local organizations from arts, educational, community services and/or cultural heritage backgrounds. The audiences that these organizations serve consist of various groups of Edmontonians, including school-age children, Indigenous youth, low-income families, post-secondary students, genealogists, artists, teachers, and the public at large. Table 1 proposes several categories that may be applied to the audiences served by the organizations represented in the community consultation study population:

Table 1

Types of audiences of Edmonton Community Organizations

Audience type	Number of Reponses
Arts	7
Education	22
Families	3
General Public	9
Specialized	14
Varied	3

Though the purpose of the community consultation was to understand the local context for a digital exhibits service at EPL, a small number of provincial and national organizations were included in the data collection. Inclusion of non-local organizations was done for several reasons: they were deemed to have content or skills that would be relevant to EPL customers, they were located in Edmonton, and/or they were referred to in the survey responses by another organization. While each organization has unique mandates, audiences, and goals, for the purposes of this study, Table 2 below summarizes broad categories of organizational types that can be observed in the study population.

Table 2

Community Organizational Capacity Types

Organization type	Definition	Number of responses
Domain experts	Organizations that possess either subject knowledge or content or both	18
Catalysts	Organizations that can build projects or finance them through grants or both	9
Promoters	Organizations that may not have specific content or capacity to build but can bring in new audiences for digital exhibits	5
Multi-talented	Organizations that have various combinations of the above expertise, sometimes all at once	25

Organizational expertise

The first multiple choice section of the survey aimed to gather information on the range of knowledge, skills, access to content, access to funding, and other resources that participating organizations might have in a potential collaboration to create digital exhibits. The following table summarizes the responses received.

Table 3

Community Organizational Expertise

Expertise	Number of responses
Subject specialization	40
Promotion and partnership with other organizations to further digital exhibits	34
Access to digital content that can be organized, modified or curated	30
Access to print or physical materials that can be digitized	29
Access to other resources, such as media, software, etc.	24
Partnership on grants to support digital exhibits	23
Web development skills	20
Game development skills	20
Ability to provide metadata to contextualize exhibits	20
Software development skills	15
Financial capacity to support digital exhibits	4

Other expertise mentioned:

- Best practices when working with multimedia
- Project management in multimedia contexts
- Peer-evaluated submission process for artistic projects
- Animation and graphic design

Library's roles in Digital Exhibits Service

The following section asked the survey participants to rank, on a scale from 1 to 8, the various roles they might see the Edmonton Public Library playing in terms of a future digital exhibits service, with 1 being the highest priority and 8 being the lowest priority. The following figures break down the responses to this question based on those rankings.
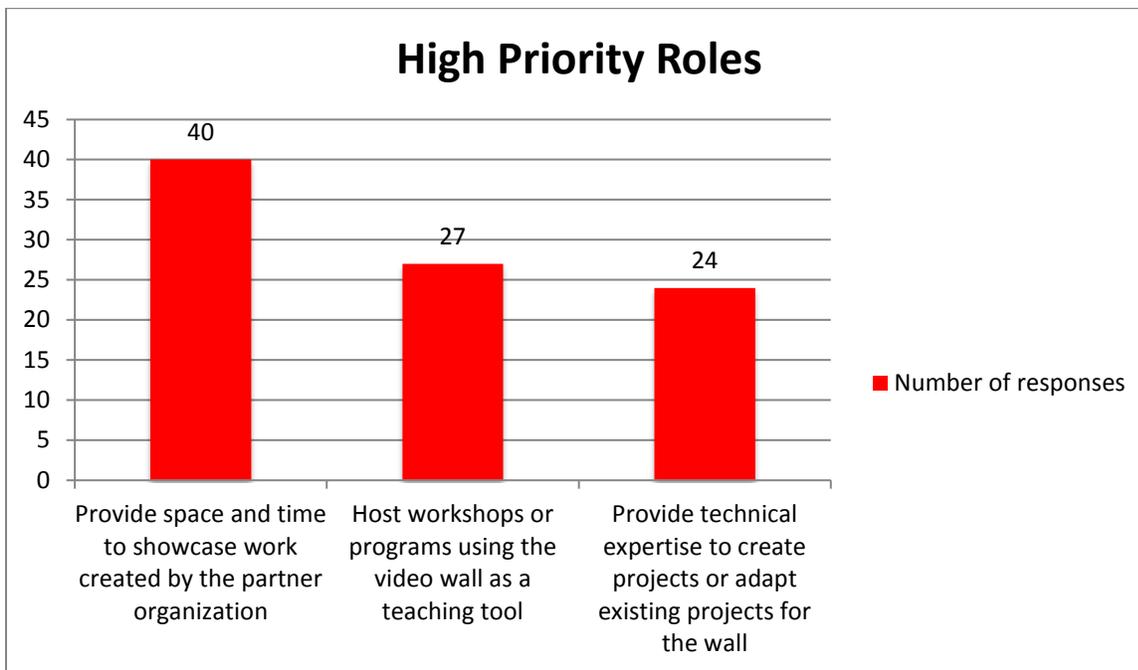

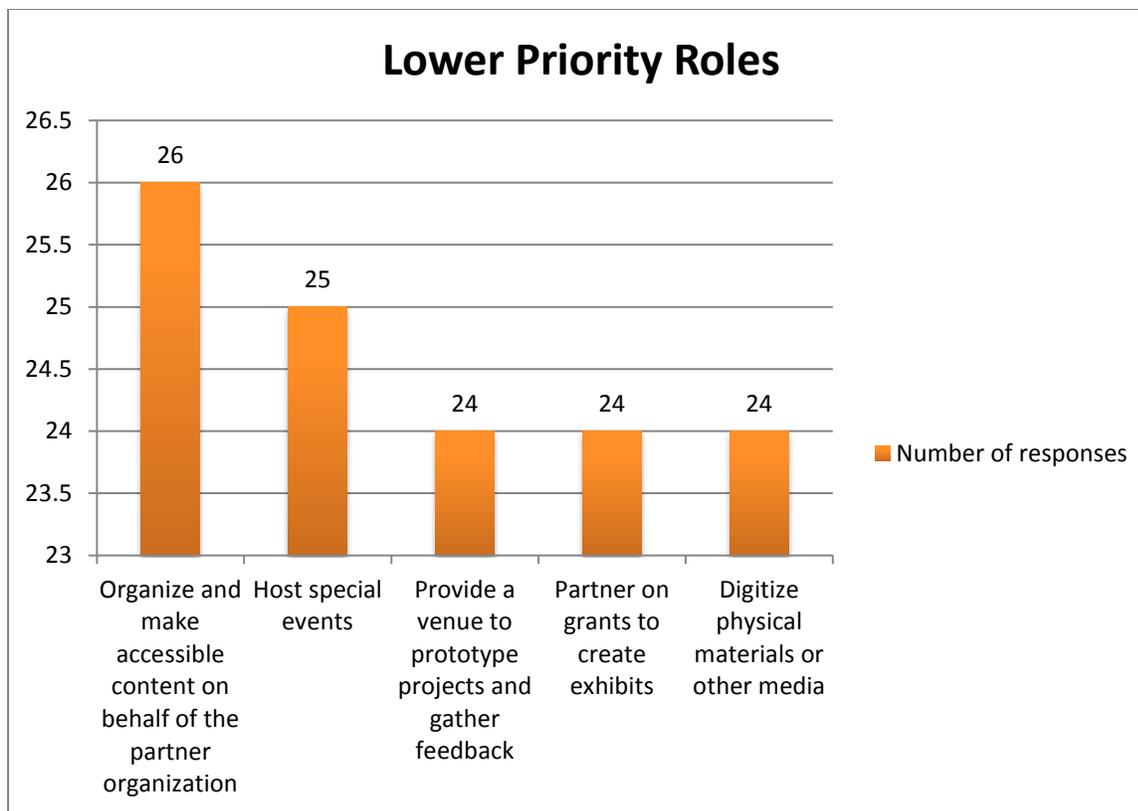*Figure 1*. High priority roles identified for the Edmonton Public Library

Lower Priority Roles

Figure 2. Lower priority roles identified for the Edmonton Public Library

There were no responses that received majority rating as "low priority." In other words, survey participants rated all options provided in this section as being either high or medium priorities for the organizations they represented.

Other proposed roles for EPL to play in terms of a digital exhibit service, according to survey participants included:

- "Cultural and pedagogical venue"
- "Champion the use of technology in the community"
- "Connecting on public programming"
- "Continuing to grow the maker space"
- "Exhibition space that works directly with artists"
- "Host artwork from the provincial art collections in the digital interactive exhibit"
- "Fun for children and somewhere for adults to have a chance to discover and explore"
- "Provide a venue for a digital festival"
- "Providing exhibit access to organizations for training purposes"
- "Provide new opportunities to engage the public in history and heritage issues"
- "Being hub for showcasing creative projects throughout the city"
- "Provide learning opportunities for our artists about how best to engage with this new interactive technology to expand their art practice into new forms"

Modes of interaction

The middle section of the survey aimed to gauge the interest in various modes of interaction with the digital display wall. Specifically, the author asked about what types of experiences the audiences of the participating organizations would want to have with the digital display wall in the new Milner Library. Survey respondents could choose multiple answers from a list of nine options, which are summarized in the Table 4 below.

Table 4

Modes of Interactions Prioritized by Community Organizations

Interaction Mode	Number of responses
Touch	50
Gesture or motion	45
Mobile	42
Video content	42
Audio content	36
Gaming and 3D environments	33
Web content	32
Special device interactions (ie. stylus, wearables, etc)	29
Ability to plug in own device	28

Digital Exhibit Project Themes

The last section of the survey was designed to gather qualitative data in the form of long-form responses to questions about potential projects of interest as well as any other feedback. In total, 116 exhibit ideas were suggested, organized below by decreasing number of total responses.

Art (n=28, p=24%)

This category is not surprising, given the highly audio-visual nature of digital interactive displays, and brings together ideas for exhibits related to visual art, performance, design, architecture, and music. For example, interactive art projects, "making space" initiatives, work by local designers and performance artists, space for film screenings and filmmakers to experiment and showcase their work, as well as photography and projects that facilitate creativity were recurring ideas in this category. Projects with cultural components, such as "drumming, storytelling, interactive songs/games from other cultures" and a "creativity wall where students can design research approaches to their questions" were also mentioned. Other suggestions included "an active drawing tool for students and faculty to visualize concepts when brainstorming group ideas" and

related "active multimedia for idea generation", "opportunities for our local filmmakers to learn how to make media art using the new technology" as well as "large multi-player games, artists showcase, and live art/technology performances."

Heritage (n=18, p=16%)

This category of exhibits reflects interest in local history. For example, digital tours or 360 degree views of local places were mentioned, such as the River Valley, Alberta railways, aviation history, and historic buildings. Other suggestions included "interacting with layered maps of historical and environmental data about the City", oral histories from all communities, and "vignettes on famous Edmontonians and their contributions" including a "feature on the Famous Five and their contribution, all of whom resided in Edmonton."

Civic (n=16, p=14%)

This category aims to reflect the interest in visualization of open data, community engagement, and Edmonton-specific issues, as expressed by survey participants. For example, a space for newcomer stories, 3D exhibition of Edmonton's evolution as a city, community-created maps of downtown, digital human library that allows participants to learn about their fellow Edmontonians, interactive statistics about key topics related to city life such as literacy, movies, music, homelessness as well as interactive polls were all ideas that fit in this category of potential projects. As well, opportunities for civic engagement around issues within the city were mentioned, such as "ask questions, allow answers" polls, digital mapping of the city, and "programming that highlights Edmonton's connections globally".

Science and Technology (n=12, p=10%)

This category brings together exhibit suggestions concerning learning about and using skills related coding, programming, virtual reality, augmented reality, citizen science and crowdsourcing data, space exploration, robotics, etc.

First Nations/Indigenous content (n=10, p=9%)

Ideas in this category were not specifically defined by survey participants, but can be interpreted to mean storytelling both Indigenous in content and in delivery method. The following specific exhibit ideas were suggested: Indigenous artwork and music, stories and storytelling, sharing circles, interactive educational exhibits for children and adults of all ages.

Youth and children (n=10, p=9%)

This category includes K-12 provincial curriculum content, school-age student project showcase, and school-age STEM-oriented programming and content. For example, projects related to the school curriculum or school-age interests were repeated in the suggestions, such as discovering shapes, colours, animals, lifecycles, and weather. As

well, family events, children's gallery space, and learning opportunities for school field trips were recurrent suggestions.

Digital Storytelling (n=8, p=7%)

This category can also be considered as storytelling more broadly using the digital wall in some way. Projects in this category were not specifically defined, and the term is used very frequently though it could mean a range of immersive or passive experiences.

Other (n=7, p=6%)

- Physical activity programs and "community involvement in sports"
- Public Health training and environmental assessment
- Digital festival
- Film screenings

Ecology (n=6, p=5%)

This category reflects interest in topics such as conservation, environmental assessment, interactive maps of the River Valley trail system, as well as points of local natural interest, animals, and sustainability. As well, "live camps of species at the Zoo", "maps highlighting connectivity of the River Valley" and geocaching programs were specifically mentioned.

It is clear from observing these categories that many exhibits may contain several themes. For example, an Indigenous storytelling display about the history of the River Valley and in-person program may be about art, local history, First Nations topics, and ecology. The number and range of exhibit ideas indicated the rich potential in this type of service and the interest in EPL's customer base for unique and meaningful experiences with a particular emphasis on the local.

Interview Findings

As individuals interviewed represented organizations with different types of expertise, they did not comment on all questions with equal detail. Additionally, every organization provided recommendations within the context of their domain. Nevertheless, a large number of suggestions was collected during these interviews and several trends emerged, which aid in digital exhibit service planning. They are organized thematically below.

Project Design

Suggestions gathered in this section relate to exhibit planning and service design.

- Integrate user experience and design thinking approach at the core of the Digital Exhibits service

- With the help of designers, developers, and architects, write clear use cases for the digital interactive wall, which can then drive exhibit specifications
- Consider hosting a charrette with designers, makers, and developers to explore options for content extension and to think holistically about the technology service
- Similarly, hosting a half-day workshop that brings together experts in video game, design, animation and other skills allows the Library to recognize the limitations in house and guide drafting future project specifications
- To ensure success when seeking submissions, be as specific as possible in content requirements by including technical specifications, file formats, sizes, colours, etc.
- Motivate local creators with money, promotion, or portfolio-building opportunities
- Investigate options for tactile inputs for children in interactive exhibits
- Exhibit curation can focus on a theme, specific audience (ie. youth), emerging need in the community, or an identified issue relevant to the community (ie. poverty reduction)
- Artist-in-residence programs are a great way to generate content in a short amount of time with limited risk
- When designing for interaction, identify pain points (make a user's life easier) or empower users (allow them to do something they can't do anywhere else), as these are primary motivators for user participation
- For complex projects, organize an advisory group to guide exhibit planning

Exhibit Prototyping and Testing

Suggestions gathered here address specific processes related to developing, testing, and improving digital exhibits.

- Collect real-world user data based on library customer interactions in real space and in real time.
- Abstract the situation: recreate the potential functionality of the larger digital exhibit and outline clearly what is to be accomplished through this experience. What problem is the exhibit aiming to solve?
- Break down complex interactive systems into individual variables: What element is being tested at every instance of the prototype?
- Apply design thinking to the process: the digital display is a starting point for ideas, learning, literacy, conversation, and cultural reflection. What kinds of experiences does the Library wish to facilitate through this tool?
- For the final, large-scale exhibit, less than real-time and real-space would be an unreliable test environment. For example, leave the exhibit up in a library branch for 3 weeks, testing different content and different features. Do users engage with multi-touch features as planned? Are motion-based interactive features used by real people? Do users miss the point completely?

Collaboration, Outreach and Promotion

The following suggestions relate to opportunities to share information with community partners and promote the digital exhibits service more broadly.

- Advertise exhibit projects as small requests for proposals with detailed instructions and clear expectations to guide community partners' contributions
- Preserve exhibits in digital public space to allow creators to demonstrate their contribution to the Library as well as entice new creators to contribute in the future

Technical Considerations

These recommendations focus primarily on technology needed to execute the exhibits. For more tools and platforms related to digital exhibits, please see Appendix I of this report.

- Test at all points of the exhibit to understand the technical performance of the hardware and software involved in exhibits
- Prioritize performance over quality in exhibits: content needs to load quickly and reliably
- Design for accessibility by all users, such as those visually and hearing impaired, wheelchair access, and other needs
- Unity3D is a more accessible platform to pursue for exhibit development than Unreal, Torque or other game engines, because it is relatively easy to learn and has a large community of practice where to seek help, support, and share knowledge
- Investigate opportunities to integrate Near Field Communication technologies (part of many mobile devices) that can enrich the digital exhibits and Library experience
- If building a multi-surface installation, consider if one side of the wall has an option to interact with the other. Smart cameras on both sides may allow a "virtual mirror" to the other side. Additionally, one side may be able to control, influence or have input into what happens and is available to the other side of the wall through sensors, mobile, touch, etc. This will facilitate EPL customers to interact with the technology and each other to foster a social space.
- Gamifying the public display through mobile devices creates opportunities for personalization and engagement with the Library
- Investigate feasibility of exhibits that use "persona-based" or conversational user interface, such as an artificial intelligence-driven character to help guide the interaction
- Retain some degree of control over sound, such as the ability to turn it on during specific times and adjust volume, as sound is an important element of digital experiences
- Investigate solutions for sound control such as Bluetooth or wireless connectivity and/or parabolic speakers that create an "audio spotlight" effect

Discussion

Digital exhibits services are new to public libraries and few models for content creation and partnership exist in the library field. Findings from the community consultation survey suggest that external sources of content are available to support curation of unique, locally-themed exhibits in Edmonton, and likely, other cities as well. However, management of both content and relationships with those external sources is to be expected in the pursuit of a digital exhibits service.

In this emergent service, EPL is likely to continue to serve as a community and learning facilitator. However, results from this study suggest that community partners look to the Library to act as a technical lead on digital exhibits. Findings in Table 4 indicate a high priority placed on this role by Edmonton community organizations to be played by the Library. In addition, several findings suggest the need for public libraries pursuing a similar digital service to dedicate organizational capacity to development of digital exhibits. For example, the number of areas of project design gathered through the semi-structured interviews point to the complexity involved in creating engaging interactive digital exhibits. Further, web development and game development skills were rated much lower in organizational expertise survey (Table 3), as they are arguably highly specialized and in demand within the broader economy. It is reasonable to generalize these findings to other urban contexts in North America.

EPL can rely on its community partners for content, promotion, and some degree of financial support, though the extent of funding reliance is to be determined through project prototyping and further collaboration. Staff dedicated to this service should also continue to offer digital literacy programming, as data gathered indicates a need for workshops and programming in the community. It is also evident that a wide interest in exhibit subject matter exists in the Edmonton community, and many topics will likely appeal to library customers, as suggested by the survey results. Findings support the model of incorporating STEM programming into digital exhibits services as well as extending that content through current makerspace, youth, and adult programming. Piloting a small number of projects before the final hardware installation is a good practice to follow, as it minimizes the risks and formalizes workflows required to develop more complex interactive exhibits.

Further, the community consultation findings indicate that a digital exhibits service should focus on touch-based and gesture-based interaction, as this is what the community prioritizes to date. Staff dedicated to the service should then apply lessons learned from touch and motion-based exhibits to mobile interactivity as the service matures. A more detailed study of specific staff skills needed to support a digital exhibits service in a public library context was also conducted as part of the Digital Exhibits Intern Librarian research project, and can be examined as an additional study to this paper.

Data gathered through the semi-structured interviews indicate broad areas of digital exhibit services that may be viewed as stages of an interactive project, including project planning, project development, technical, resourcing, and promotion aspects of the

work. No indication whether specific project management methods, such as a waterfall approach, an agile approach, or a combination of the two, may be more suitable to digital exhibits development in public libraries. Additional research conducted through continued engagement with the community partners, pilot project deployment, and reflection on emergent practice, is needed to propose effective methods to digital exhibit development.

Limitations

There was some variation in the backgrounds of individuals who answered the survey in terms of their understanding of the digital display technology, its potential, and extrapolation of user needs. It is possible, therefore, that there was a gap between what survey respondents reported as having (in terms of content, skills, or funding opportunities) and what their organizations actually had available. Given the nature of survey as a research tool and lack of opportunity to clarify responses, this limitation became apparent in certain responses received. While the types of organizations contacted to participate in the community consultation were well aligned with EPL's mission, it is possible that some organizations in the areas of sport, recreation, design, or community services were not targeted. Consequently, it is uncertain if there are gaps in content, capacity for exhibit development, or project support that exist in the wider Edmonton area. Finally, the list of exhibit themes should not be seen as exhaustive or representative of all Edmontonians, as some suggestions were counted in multiple categories. These limitations were addressed by increasing the sample size and allowing multiple individuals within a single organization to answer the survey. In addition, a recommendation for conducting further research into community groups not represented in this study has also been proposed.

The main method of recruitment for participation in the semi-structured interviews was referral or recommendation from other community organizations. Due to the diversity of organizational backgrounds covered in this section of the project, no standardized questions were posed in every case, and therefore no consistent domain of expertise emerged. This limitation was addressed by growing the sample size and aiming to address the overall goals of the semi-structured interviews, as outlined in the Methods section, until recurrent themes emerged.

Conclusion

It may be unrealistic for public libraries to establish dedicated production studios to create content for digital exhibits. Instead, content partnership models are suitable to public library workflows when planning for a digital exhibits service. Clearly identifying and communicating the infrastructure available for such partnerships is key. For example, working with community partners will require outlining the technology "stack" such as what tools, platforms or technologies are used to collect, organize, and display content for exhibits. However, more important than technical components of digital exhibits services in such partnerships is the ongoing process of relationship management. Continuing to engage with community partners in order to understand their changing needs, priorities, and relationships is an activity crucial to digital exhibits.

Additionally, curation and project management skills are also significant to services of this nature, as indicated by the findings in this study. Initially, resources, expertise, and the suite of services may be minimal and need to be prioritized. As such, significant amount of co-learning with partners of all types will need to happen. Analysis of the study findings has also suggested the need for a community of practice with semi-standardized approaches, technology solutions, guiding principles, and sample workflows. Semi-formal channels for knowledge sharing related to such emergent services are also needed.

While each public library context is unique, it is likely that in major urban areas, libraries pursuing this type of service will have a mix of community partner "profiles" that may play different roles in exhibit development. Types of community partners that likely exist in most cities, as identified in this study, include domain experts, facilitators, catalysts, financiers, content owners, and promoters. Conducting a community assessment and building a detailed portrait of the local context, similar to that carried out as part of this study, will help public libraries identify needs, interest, resources, and gaps related to digital exhibit services should they pursue such service directions.

Finally, the importance of user-centered design is clearly evident in this study as well, and suggests that digital exhibits require new approaches to project development compared with other areas of library services. For example, workflows associated with digital interactives require revision and iteration, which have implications not only for service design and execution, but also communication, marketing and program delivery to library customers. While this iterative process may seem challenging as compared to other services, arguably, when carried out according to principles of user-centered design, such digital exhibits services educates the public library users about contemporary library services as always improving, relying on evidence and research to build a better experience for all.

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Appendix A. Community Consultation Survey

Purpose and Context

In 2020, the Stanley A. Milner Library will reopen after extensive renovations to both the interior and exterior of the building. As part of the interior renovations the Edmonton Public Library will have installed a 2-storey digital interactive display wall, modelled after Queensland University of Technology's The Cube located in Brisbane, Australia. To view a video of The Cube in action, please click here.

Digital interactive display walls allow for a variety of interaction between the display and individuals, including audio, touch and motion. In anticipation of this new resource, EPL would like to understand the current interest from Edmonton's arts, cultural, non-profit and community organizations in terms of ability, interest and potential to collaborate on digital exhibits to be displayed on this wall. Please take a few minutes to complete this survey to provide the Edmonton Public Library valuable feedback on developing this community asset.

Your participation in the survey is voluntary. Your input will help define needs and interests in our communities for new technology services specifically related to using the digital interactive display wall. If you have any questions or would like to discuss this project further, please contact Lydia Zvyagintseva, Digital Exhibits Intern Librarian at **780-496-8832** or **lzvyagintseva@epl.ca.** Thank you!

Please state your organization's name: _____

Please provide your name: _____

What is your title or position in the organization? _____

Please provide your email address: _____

Please provide your phone number: _____

Who is the primary audience for your organization? _____

In a potential collaboration to create interactive exhibits, what expertise would you describe your organization to have? Please select all that apply:

- subject specialization (ie. local history knowledge, visual arts, robots)
- software development skills
- web development skills
- game development skills
- access to digital content that can be organized, modified or curated
- access to print/physical materials that can be digitized
- access to other resources (media, software, performance)
- ability to provide metadata (contextual information about collections or content)
- financial capacity to support digital exhibits
- partnership on grants to support digital exhibits
- promotion and partnership with other organizations to further digital exhibits
- other: _____

What role would your organization want the Edmonton Public Library to play in terms of a digital interactive exhibit service? Please rank them in order of importance to your organization, with 1 being the highest priority and 8 being the lowest priority:

- provide space and time to showcase work created by your organization
- host workshops or programs using the video wall as teaching tool
- provide a venue prototype projects and gather feedback
- partner on grants to create exhibits
- provide technical expertise to create projects or adapt existing projects for the wall
- organize content on behalf of the organization, make content accessible
- digitize physical materials or other media
- host special events

If there are other roles you see the Edmonton Public Library playing in terms of a digital interactive exhibit service, please state them below: _____

What types of experiences would you want to have with the digital wall in the renovated Milner Library? Please select all that apply:

- Touch interaction (ie. smartphone style touch-screen on a bigger scale)
- Motion interaction (ie. Kinect-style movement sensor)
- Special device interaction (ie. stylus, brain-wave reader, etc)
- Mobile interaction
- Gaming and simulated environments, including 3D and virtual reality
- Web content
- Video content
- Audio content
- Ability to plug in own laptop, tablet, phone
- Ability to connect wirelessly using a mobile device
- Other: _____

What kinds of projects would you like to see on the digital video wall? Please list as many as you wish and provide brief descriptions. (For example, local history digital tours, First Nations storytelling, science and technology school-age programming).

Is there anyone else you suggest we contact in the Edmonton community?

Is there anything else you wish to add?

Thank you for taking the time to provide your input!

Appendix B. Survey and Interview Participating Organizations

The following organizations have participated in the survey and/or the semi-structured interviews conducted as part of this study. The majority of organizations included in this list are local to Edmonton, with some provincial and national organizations also represented.

Organization Name	Organization Name
ABC Head Start	Historian Laureate Program
Alberta Foundation for the Arts	iHuman Youth Society
Alberta Railway Museum	Latitude 53
Alberta Teachers' Association	MacEwan University, Art and Design
Art Gallery of Alberta	MacEwan University, Design Studies
Athabasca University, Royal Architecture Institute of Canada	MacEwan University, Communication Studies
Ben Calf Robe Society	MacEwan University Library
City Hall School	MacEwan University Social Innovation and Entrepreneurship Hub
City of Edmonton, Citizen Services	Media Architecture Design Edmonton
City of Edmonton Archives	Music Media Technology
City of Edmonton, Open City and Innovation	National Centre for Truth and Reconciliation
Concordia University of Edmonton, Edmonton Institute for Community Research	National Film Board of Canada
Concordia University of Edmonton Library	Nina Haggerty Centre for the Arts
Design Students Organization of MacEwan	Northern Alberta Institute of Technology
Digital Scholars Group, University of Alberta	Norwood Child and Family Resource Centre
Edmonton Arts Council	Onlea Corporation
Edmonton City as Museum	Parkland School Division 70
Edmonton Digital Arts College	Provincial Archives of Alberta
Edmonton GameCamp	River Valley Alliance
Edmonton Heritage Council	Royal Alberta Museum
Edmonton Public School Board	Taproot Edmonton
Edmonton Symphony Society	TEC Edmonton
Edmonton Valley Zoo	The Student Design Association
EgoAnt Productions Inc.	University of Alberta, Computing Science
Film and Video Arts Society of Alberta	University of Alberta, Humanities Computing
Gather Ventures	University of Alberta, Urban Planning
Glenbow Museum and Archives	