ABSTRACT – University of Washington, Health Sciences Library

The University of Washington Health Sciences Library requests a grant of $25,000 from the Institute of Museum and Library Services' Sparks! Ignition Grants for Libraries program for ***Medical Libraries of the Future: a partnership to create a Medical Virtual Reality Studio to address Heart Conditions in the Puget Sound Region***. We propose to develop a 10-12 page print and online "how to" primer for US medical and research libraries to use to create their own virtual reality (VR) and augmented reality (AR) studio and services for group/team use to solve real patient and community problems. This tool will help IMLS build a national digital platform to organize and advance innovation in medical and research libraries who are interested in implementing VR services for team healthcare and interprofessional education.

Medical and research libraries are increasingly compelled to provide innovative services to a rapidly changing healthcare environment. We prize innovation as a key to sustaining a competitive edge in a rapidly changing landscape of library services and library space.

With this primer, medical and research libraries across the US and Canada will be able to design, plan, implement and evaluate VR studios for healthcare group or team use in an easy to understand format. In addition, the results will aid their IT staff, librarians, and healthcare providers in developing stronger and more innovative library services, factoring in design considerations.

This project fits within IMLS strategic goals one: learning and four: access. Every doctor, nurse, dentist, working in our teaching hospitals and nation's libraries, should be technically developing new skills, including the use of VR and AR technology in healthcare. This project gives healthcare professionals access to life-long learning skills using the latest technology. Medical libraries a unique capacity to reach this unique audience, especially pre heart surgical teams in teaching hospitals, and to develop learning experiences in every discipline and create a role for librarians on the healthcare team and helping patients with heart conditions.

Upon completion the results will be shared with libraries and teaching hospitals across the US through listservs, open access repositories, and presentations at two national library conferences, including the American Library Association and Medical Library Association.

From left to right: Cardiologist, Research Scientist, Surgeon, Radiologist, Scrub Nurse, VR Expert, and Librarian

1. Statement of National Need

According to German & Sandore Namachchivaya, "Research (medical) libraries increasingly prize innovation as a key to sustaining a competitive edge in a rapidly changing landscape of library services and content. While informal data suggests that research libraries have increased the amount of effort on innovation and R&D in the past decade, it is not clear in what areas these efforts are focused and if the activities are integrated into the library's organizational structure and processes." (German & Sandore Namachchivaya, 2013).

Project Purpose: National Digital Platform

The purpose of this IMLS national digital platform grant proposal is to organize and advance the current state of innovation in medical and research libraries for both virtual reality (VR) and augmented reality(AR) by producing a "how to" primer for those medical and research libraries who are interested in developing a VR or AR library service and program.

Demonstrating a national need: results of a national survey of academic health sciences libraries

The PI (applicant) surveyed over 140 academic health sciences library directors in May 2017 to investigate the current state of VR studios or VR use in medical libraries. There were 15 respondents. The survey sought first to understand which libraries had built VR studios/programs, which were thinking of building programs or studio related to VR, and which libraries thought that they would benefit from a foundational primer to discuss how to develop VR or AR activities. Data collected (*see: Figure 1 below*) showed national US interest from small and large medical and osteopathic libraries who are eager to see a primer and better understand how to support training, R&D, technology, funding and architectural design considerations. **(*See: Letters of support*)**

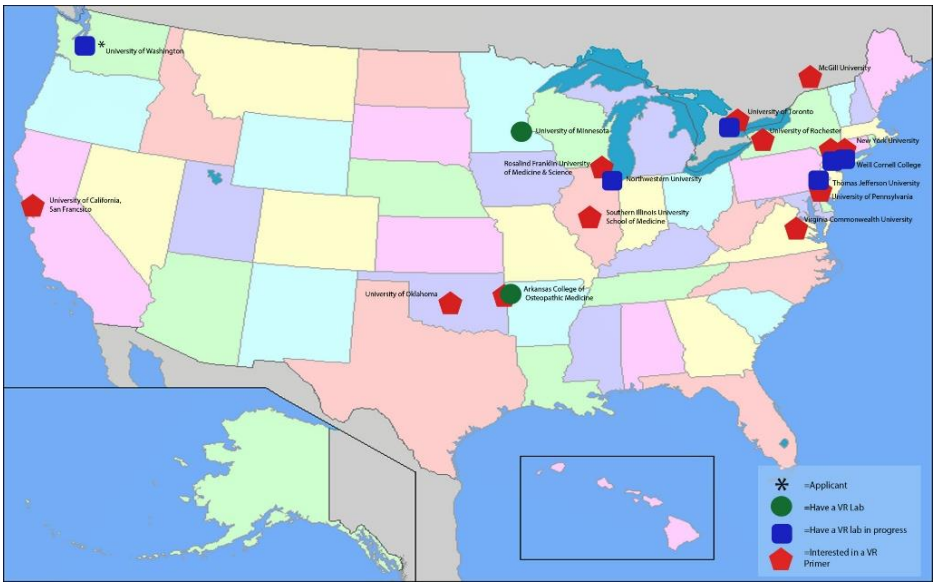

Figure 1: Survey of Academic Health Sciences Libraries interested in VR primer (May 2017)
Medical libraries in the United States and Canada that 1. have a VR lab space; 2. have a VR lab space in progress (or are planning one); and 3. are interested in a VR primer.

Project Aims

There are two major aims to this project to:
1) plan, design, build, test, and access a Virtual Reality (VR) program and studio for medical professionals in a health sciences library environment at the University of Washington and;

2) to spur innovation in medical and research libraries by publishing a primer for other libraries to use to plan, design, and implement their own virtual reality and augmented reality programs.

Background

University of Washington Health Sciences Library & School of Medicine

The Health Sciences Library is the premier health sciences library in the Pacific Northwest. Under the leadership of Tania Bardyn, the Library received $7,941,884 in NIH grants for 2016-21 and $6,194,776 in contracts from the state for 2017-19.

The University of Washington School of Medicine, a component of UW Medicine, continues to rank as the nation's top medical school for primary care education and No. 2 in research funding in the latest U.S. News & World Report Best Graduate Schools (2018 edition). This is the 23rd time in the 24 years of this U.S. News ranking category that it has held the No. 1 primary care position. The UW School of Medicine's medical student teaching programs were rated No. 1 in family medicine and No. 1 in rural medicine. Based on the U.S. News accounting of National Institutes of Health funding, the school received $638.8 million in NIH grants in fiscal 2016 and is second to Harvard University, a private institution, in the amount of this federal funding. In addition to NIH funding, UW Medicine faculty also attract grants from foundations and other sources for a total of more than $1 billion per year of research funding.

Medicine and VR Imaging

In medical and health science fields, medical imaging represents a key form of data visualization, especially with regards to pre-procedural and surgical planning and preparation. Most people have heard of Computed Tomography (CT) scanning, for example, a common two-dimensional (2D) form of medical imaging. However, research shows that three-dimensional (3D) stereoscopic imaging leads to improved imaging comprehension by medical professionals, thus improved patient results (Getty et al., 2008; Hernandez et al., 1998; Kockro et al., 2013; Sun et al., 2009; Zhou et al., 2006). Virtual reality (VR) and augmented reality (AR) technology offers the opportunity to convert traditionally 2D imaging into 3D visualizations.

In VR imaging, the user wears completely opaque goggles that obscure their vision entirely and instead provide a 3D, digital image with which they can interact. In AR imaging, the user wears transparent goggles that superimpose 3D digital images onto their surroundings. Both technologies are used in medicine for various, often similar, purposes.

The increasing complexity of medicine necessitates a collaborative, multidisciplinary team to deliver the best care. A patient who comes to the hospital with symptoms from a diseased heart valve will first be treated in the emergency room by doctors and nurses, as well as pharmacists. The patient will likely have imaging obtained by an x-ray or CT technician and interpreted by a radiologist. The patient

may also undergo an echocardiogram, a moving ultrasonic picture of the heart, which is performed by a sonographer and interpreted by a cardiologist or anesthesiologist with imaging training. The patient will likely be seen by a general medicine team, a team of cardiologists, and a team of surgeons. At some point, a decision may be made to take the patient to the operating room or the catheter lab for an intervention. All these caregivers must share information they have obtained and come to a consensus on a care plan. Traditionally, this is done through a series of notes left in succession in a chart. The rich data obtained in the imaging is, likewise, condensed into a short report containing only words.

VR Studio for Medicine

A VR studio tells the story of the patient through an immersive experience that allows multiple people to contribute to the holistic picture of a patient. In the above scenario, caregivers for the patient could meet to plan for an intervention. This team would include an interventional cardiologist, a surgeon, a radiologist, an anesthesiologist, an interventional cardiology nurse, an x-ray technician and trainees such as fellows, and residents and medical students from various disciplines. A librarian would serve as the liaison between the team and the data, including both the virtual images as well as reference data such as articles which may aid the team in deciding on a procedural plan. A team leader may step into virtual reality and serve as guide, walking the team through the patient's unique anatomy and pointing out possible challenges or places where a misstep could occur. The team experiences the data through the eyes of the team leader by watching on a screen, as well as by watching the movements of the team leader as he or she interacts with the data. The team can ask for the leader to manipulate the data in ways that allow for them to plan the best approach for the procedure. The team members may also, in turn, step into the virtual space to interact more deeply with the data. Trainees may have the opportunity to rehearse the procedure and potentially prove their mettle. The patient may even be a participant, asking questions and gaining a deeper understanding of his or her health from this experience.

The potential usefulness and importance of VR technology for medical applications has been acknowledged by medical professionals since the 1990s (Kaltenborn & Rienhoff, 1993; Satava, 1995). Researchers at the University of North Carolina began publishing about using augmented reality techniques in performing biopsies on patients nearly 20 years ago, in the early 2000s. The UNC experiments found that using augmented reality (AR) techniques to guide the biopsy procedures proved more accurate than the traditional method of using ultrasound (Rosenthal et al., 2002). Despite the early promise of using VR and AR techniques in medicine, two major limiting factors have prevented its widespread adoptions: the requirement for large amounts of computing power, particularly graphical computing power, and the cost. Until very recently, the kinds of graphical and processing power necessary to produce three-dimensional virtual environments have been prohibitively expensive, thus unavailable to all but the most, well-funded of research institutions (Kaltenborn & Rienhoff, 1993). In the last few years, however, the prices relative to computing power have plummeted. It is now possible to put together a high-quality VR-capable computer system for less than $5000, making access to this technology much more achievable now than in the recent past.

Why Medical Libraries and VR?

Medical libraries are well-positioned to house VR studios to serve medical communities that are collocated near hospitals and/or medical schools. Access to VR spaces will help these communities to

visualize cases in three dimensions before meeting patients, simulate surgical work flows, identify risks, and enhance team communication and inter-professional learning. As the responsibilities of medical libraries have shifted largely from the collection and storage of print materials to providing access to digital materials the issue of data access has also become a responsibility of these libraries. Many libraries employ specialized data librarians trained to aid patrons in all manner of data-related questions including data management, data curation, and data visualization (Chen 2017; Surkis et al., 2017). Libraries are at the forefront of all aspects of data management, and VR techniques in medicine are a more accurate and sophisticated form of data visualization. Virtual and augmented reality technologies are data heavy, and librarians' growing expertise in this field will provide essential support to patrons using this technology for medical purposes.

There is growing and demonstrable interest among medical libraries nationwide regarding the implementation and application of virtual and augmented reality equipment and spaces in libraries. Multiple institutions are either planning or considering adding VR technology or a VR space to their library. A few have are already begun incorporating VR into their library services. Medical libraries often have the space required for effective use of virtual reality technology, in addition to providing a neutral, centralized location for users' ease of access. Since scholarly and medical literature has gone almost entirely digital there is also the question of how to bring users back to the library space itself. By providing the space, technology, and expertise for using virtual reality equipment medical libraries can also increase patron traffic and bring researchers and clinicians back to the library.

Spurring Innovation Adoption: Current state of Virtual Reality in medical libraries

a) University of Minnesota

While the use of VR in medical and health settings is growing, its adoption in medical and health sciences libraries is still in its infancy. The University of Minnesota Health Sciences Library offers its patrons access to a complete VR studio space, with plans for future expansion. They have had interest from diverse groups including biophysicists, medical students, and computer scientists. There has also been interest in using the UMN Bio-Medical Library's VR studio to model patient anatomy in a similar way to the interest shown by clinicians at UW (personal communication).

b) University of New England Osteopathic College

The University of New England Osteopathic College, in partnership with their library, established a temporary VR space in the library for students working on the *We Are Alfred* project. *We Are Alfred* is a software that allows medical students to experience what it's like to be an elderly man (named Alfred) trying to interact and communicate with medical professionals while experiencing loss of hearing and vision (Bouchard, 2017). UNE is currently working on a report about the *We Are Alfred* project and its outcomes, but preliminary interviews and surveys with users demonstrated the profound effect the experience had on the students who participated. After sessions, students reported an increased understanding of the challenges faced by disabled and elderly patients, and reflection on what kind of efforts need to be made in order to better accommodate patients who may face barriers such as disability. Initiatives such as this demonstrate the profound effect VR technology can potentially have on medical education, training, and patient outcomes (personal communication).

c) University of Washington

While UNE's virtual reality initiatives focus more on the educational opportunities VR offers medical students, at the ***University of Washington*** medical researchers have so far expressed ***greater interest in the clinical and research applications of VR imaging***. The two approaches are not mutually exclusive and complement each other well. Neither research nor educational usage requires different types of equipment, thus it would not be a challenge for an institution to incorporate educational projects such as *We Are Alfred* into VR use or vice versa.

Our proposal has two major elements: 1) to purchase VR equipment and create a useable VR space within the existing Translational Research and Information Lab (TRAIL) present in the UW Health Sciences Library and 2) to create a primer for other medical and health sciences libraries to evaluate the potential of VR and implement it in their library space. This would include information about and comparisons of the competing VR hardware and software, computing and equipment requirements, and space requirements. In addition, this document would provide comprehensive, step-by-step instructions on how to bring VR technology into the library, including how to reappropriate space where it might not be possible to construct or renovate a space from scratch. The primer will mainly focus on medical libraries, however, much of the information will likely be of interest to academic and research libraries in general.

2. Project Design

The goal of the VR studio set-up is to identify design considerations when designating a library space for VR and AR use. The goal of the primer is to bring expertise and guidance to medical libraries so they can transform under-used spaces into functional, VR-enabled spaces. Libraries across the United States are starting to explore creating VR studios, but lack of funding and limited knowledge on how to approach studio builds have created barriers to achievement.

Phase 1: Translational Research and Information Lab *(completed between November 2016-April 2017)*

TRAIL Design, Technology, and Funding

The University of Washington completed construction of a Translational Research and Information Lab (TRAIL) in November 2016. This space serves the needs of researchers at the UW and advances collaboration and team science in the health sciences. The HSL was selected as the ideal space to house the TRAIL room for its central location adjacent to both the UW hospital and health science research laboratories. It was built in partnership with and with support from the Institute of Translational Health Sciences (ITHS), UW Medicine Research Information Technology, and the National Network of Libraries of Medicine - Pacific Northwest Region (NNLM PNR).

To design the TRAIL space, the UW HSL selected a staff office area to retrofit. We engaged CompView, an AV integrator based out of Seattle, to help us decide what technologies to incorporate into the lab. The ITHS specifically requested using digital signage to support researchers. The partnership decided to install a 2x3 data wall comprising six 55-inch NEC X555UNV displays, which would help health sciences clinical researchers analyze and visualize data, and give researchers the ability to send six different sources from various devices to any or all of the displays. The data wall is the primary

technological feature of the TRAIL space, though a complete listing of technologies and services provided can be found at hsl.uw.edu/trail/.

An assessment of the TRAIL space initial use has shown that there exists a regular group of users from the Center for Cardiovascular Innovation (CCVI) at the University of Washington that currently bring their own VR equipment to the TRAIL space to examine patient cardiac anatomy. They incorporate the VR technology in such a way that one user wears the VR headset and can interact with the virtual anatomical while projecting the virtual reality onto the data wall, allowing the rest of the group members can see what the headset user envisions.

Impetus for VR

After an initial meeting to engage some of these users about their use of the space, we discovered a growing interest in the UW medical community for VR-ready space in the HSL. Beyond the existing VR use in the CCVI, it was discovered that the UW School of Dentistry already regularly uses AR in their practice. They also expressed great interest in a VR studio within the UW HSL. These communications prompted us to do further research on the emerging field of VR in medicine and ultimately, to pursue this project. With the input of our partners, we determined that a VR studio in the UW HSL would consist of the already existing data wall in the TRAIL space, two VR headsets, and one designated VR laptop. A computer tower in the TRAIL space already exists to power the data wall. However, it does not possess an adequate video card for the VR headsets due to overheating concerns within the current configuration.

Phase 2: Creating a VR service within TRAIL (Forthcoming, Planned Project Start October 2017)

Because the primary interest in establishing a VR studio has come mostly from clinicians and researchers affiliated with the CCVI, the primary target audience for the studio itself is healthcare professionals in the field of cardiology. These professionals work as part of a care team and would use the VR studio to prepare for medical procedures such as surgeries.

Test VR Equipment with Primary Medicine Care Team Members

The care team would be composed of: an interventional cardiologist, surgeon, anesthesiologist, echocardiographer, radiologist, catheter laboratory nurse, nurse coordinator, patient care coordinator, and a medical librarian. It could also include catheter lab technicians and radiology technicians. Our VR studio implementation team was created with this care team in mind and the team members are experts in several of these roles. Secondary audiences would include medical and health sciences clinicians and researchers from other fields, and students who would use VR technology for educational purposes.

Audience

The target audience for the primer is medical libraries in the United States. Secondary audiences would include research libraries who may be interested in implementing VR technology for team research and group educational purposes.

Risks & Opportunities

The major risk in creating a primer for VR technology implementation is that the technology is advancing so quickly that certain information may become obsolete in a short time frame. As with other constantly advancing technologies such as smart phones, there is nearly always something newer and faster just over the horizon. However, that is always a risk when it comes to technology implementation, and in the case of VR, a high-quality system purchased now should be perfectly functional for at least three years, and perhaps beyond, before needing replacement. By focusing on the broad technical requirements necessary for VR—for example, the fact that the quality of the graphics card is the biggest indicator of a system's ability to support VR—we can provide information that will be beneficial to users even beyond the lifespans of the specific hardware in use.

Work Plan

The VR studio will be located within the 840 square foot TRAIL room that currently houses a data wall, comfortable seating, and whiteboards. ***(See Abstract for Image 1: TRAIL space)*** Seating consists of one large modular couch in a campfire configuration that can easily seat six, a smaller modular couch that can seat four, a whiteboard table with six Zenergy mesh covered exercise ball chairs, a half-dozen chairs that can be moved about the room to accommodate larger groups, and flooring that is acoustically absorbent. There are two whiteboards, one medium size whiteboard in the back of the room and one whiteboard that covers a whole wall.

Planning the "Medical Libraries of the Future" Project

After an initial meeting on May 5, 2017, it was determined that the VR studio would consist of the already existing data wall and would also include two headsets and one laptop. The software selected for this VR studio is Pear Medical's Bosc. It uses VR and AR to visualize patient anatomy in 3D for doctors and patients. Bosc uses stereoscopic head mounted displays so the visualizations appear more realistic than those on traditional desktop displays, which give the user a better understanding of depth and structure. Rather than using a mouse and keyboard, users use their hands and voice to explore the virtual reality, which, anecdotally, has made anatomical exploration easier and more precise.

The work plan to develop the VR studio consists of two strategic planning retreats involving all stakeholders to determine what equipment to purchase and where to house the equipment and then an equipment setup meeting with the architect to determine optimal layout and use. A third meeting of testing the equipment would be performed by the care team and the tech team. Monthly progress updates will occur throughout the implementation process. Integration of the new VR studio would also happen on the existing TRAIL website and reservation system. The reservation system uses the Research Electronic Data Capture (REDCap) secure web application to survey and store data and this reservation system would also be used to collect data to determine the rate of use and effectiveness of the new VR studio.

The second part of the work plan is the VR studio primer. This primer will be developed by UW HSL librarians, an architect, and members of the care team who would use the VR studio for case studies and pre-surgical preparatory meetings. The primer will be produced in print format ***(See: Budget)***, published on a website and in a printable PDF. The primer will be distributed under a Creative Commons license and deposited in open access repositories.

The estimated timeline to complete the VR studio is three months; the estimated timeline to complete the primer is six months. See timeline for details on each step of the work plan. The project phases have been divided into four quarters that are each three months long, beginning in October 2017. The anticipated activities will occur as follows:

Q1 (October, November, and December 2017):

- Conduct needs assessments for VR equipment, VR studio space, and primer content.
- Purchase VR equipment and software for use in VR studio space.
- Create and distribute a pre-test survey.

Q2 (January, February, March 2018):

- Test VR equipment in studio space.
- Conduct retreat with architect for formal review of space requirements for VR studio.
- Logo creation.
- Creation of primer content, preliminary print and web design.
- Initial VR equipment training for care team, including library staff.

Q3 (April, May, June 2018):

- Finalize primer print and web design.
- Continue VR equipment training for care team and library staff.
- Publish finalized primer in digital and print forms, including depositing in UW digital repository.
- Present primer at MLA and ALA annual meetings.
- Survey medical and research libraries.

Q4 (July, August, September 2018):

- Compilation of survey results for Annual Report.
- Completion of Annual Report.

For the detailed implementation (*see the Schedule of Completion*). Two regular monthly meetings will also occur throughout the entire duration of the project. One would include solely the UW HSL staff responsible for the project implementation and the other would include both the involved HSL library staff and the involved clinicians and medical researchers. These meetings will be used to monitor progress and ensure the goals of the VR studio implementation and primer creation are being met. This time will allow for revision of the primer content to ensure accuracy as well as input from the intended user audience as to the suitability of the VR studio construction. There will also occur regular quarterly reports for internal record keeping.

Beyond the initial first year, this project will be sustained by existing HSL employees and UW personnel providing technology support and instruction for the VR studio. The primer will be housed on an internal HSL server as well as in the UW institutional digital repository and will be available for download from the HSL website, which is maintained by the HSL's technology and systems team. The HSL anticipates growing use of the studio and is planning for expansion in the future.

To evaluate the VR studio's initial successes, the UW HSL personnel will compile four quarterly reports over the year of the project's implementation. This report will contain information on how often the

VR studio is booked, feedback in the form of open text comments, and how often instruction is requested. These metrics will be tracked using a REDCap form that will be required for users to fill out in order to reserve the VR studio space for use. At the end of the year, all of the data will be compiled for inclusion in the final IMLS report. Beyond this, the REDCap form will continue to include sections for feedback and requests for instruction. Internal metrics will help determine the ongoing effectiveness of the VR studio.

To evaluate the initial potential impact of the VR primer, pre-surveys will be distributed to the institutions that have indicated interest in the project. These surveys will collect information on the specific types of content the institutions would like to see and the types of questions they have about VR technology, its use, and its applications. This information will enable the primer's content creators to design a document that will be useful to the medical and health sciences library community.

Once created, the primer's effectiveness will be measured by post surveys distributed to the institutions that have indicated interest in the primer in order to ensure that their initial questions were adequately addressed. The number of times the primer is downloaded from the UW HSL website will also be tracked, as well as any requests for print copies. The primer and website will continue to be updated to reflect the best practices in developing an in-house library virtual reality studio with feedback from the surveyed health sciences libraries and those that provided initial letters of support.

The results of the project will be presented at both the Medical Library Association (MLA) and the American Library Association's (ALA) annual conferences in 2018. These platforms will allow for discussion of both how the UW HSL implemented the VR studio, and the content available in the VR primer and if possible, the print version of the primer will be distributed at both events.

3. National Impact

At the conclusion of this project, the UW HSL will have produced 1) a VR-enabled space in the TRAIL room within the UW HSL itself, and 2) a print and digital version of a primer aimed at other medical and research libraries that provides information on how those libraries can implement their own VR-enabled spaces. The project's successes will spur innovation in the medical and research library community. A free resource will be made available to libraries seeking to implement VR and/or AR technology to guide their approach and make highly technical information more easily understandable. This will enable these libraries to provide a high-tech, user-centered sophisticated service to their communities, thereby creating a national digital platform.

The VR and AR applications to be discussed in the primer will be applicable to all healthcare fields. With VR and AR studios in medical and research libraries, libraries will have a stronger physical home with researchers and clinicians. Libraries will enhance their role in these users' workflow by providing space, technology, data, and information expertise to envision a medical case. By working together more closely with these user groups, medical librarians will be able to foster stronger relationships with the communities they serve and continue to demonstrate the importance of librarians and services in medical and research settings.

To measure the IMLS Learning performance goal, data will be collected in the form of surveys. There will be two main groups targeted by the surveys: the users of the VR space in the TRAIL room at the UW HSL, and the medical librarians that have demonstrated interest in the primer.

Data collected from the user surveys will measure how often they use the VR equipment and space, what kind of data support they want from librarians, and what kind of work they are using the space for. In addition to surveying, data will be collected via the web analytics for information such as number of times the PDF version of the primer is downloaded, and number of times requests are received for a print copy of the primer.

These data will be discussed in the final report submitted to the IMLS at the end of the project. For the user data, the report will analyze the rates of and reasons for use of the UW HSL VR studio, as well as the types of support requested from the libraries. The report will analyze how well the primer addressed their initial questions about VR implementation in their spaces. If appropriate, the UW HSL may also decide to make certain metrics—such as the VR studio's rates of use—publicly available on the HSL website for promotional purposes.

This initiative will forward the IMLS mission to advance innovation in libraries by providing new technologies and services to both libraries and their users. These services will enhance patient care, reduce barriers to effective data visualization in medical sciences, provide new opportunities for medical education and data visualization, and offer new technology-based library services. By creating a primer that clarifies the needs and costs of designing and building a VR and/or AR studio, libraries will have a roadmap that can help all libraries with project planning and overcoming the concerns of space, budget, and technology requirements. With these new technologies available in the library itself, medical and research libraries can also draw clinicians and researchers back to their library spaces. In this way, libraries can position themselves as essential to the practice and research of medicine.

Schedule of Completion - University of Washington, Health Sciences Library

Activity	Q1			Q2			Q3			Q4		
	Oct 2017	Nov 2017	Dec 2018	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	Aug 2018	Sep 2018
Create an internal communication site using Basecamp												
Needs Assesment: Identify VR Equipment												
Needs Assessment: Design space for VR studio												
Needs Assessment: Develop an outline of content for primer												
Create and distribute pre-survey												
Purchase VR headsets												
Purchase laptop for VR headsets												
Purchase PearMed Software												
Test laptop and headsets												
Retreat: Architect reviews the space and equipment												
Create a logo by a grahic designer												
Create primer content												
Create and design the primer by a graphic designer												
Website created by HSL technology staff												
Train Care Team to use the VR equipment in the TRAIL space												
Publish the primer in a digital repository and website												
Print the primer												
Primer presented at the Medical Library Association												
Primer presented at the American Library Association												
Create and distribute post-surveys												
Monthly meetings for the HSL Library Staff												
Monthly meetings with HSL Library Staff and Clinicians												
Quarterly Reports												
Annual Report												

Qtr 1
Qtr 2
Qtr 3
Qtr 4

DIGITAL PRODUCT FORM

Introduction
The Institute of Museum and Library Services (IMLS) is committed to expanding public access to federally funded digital products (i.e., digital content, resources, assets, software, and datasets). The products you create with IMLS funding require careful stewardship to protect and enhance their value, and they should be freely and readily available for use and re-use by libraries, archives, museums, and the public. However, applying these principles to the development and management of digital products can be challenging. Because technology is dynamic and because we do not want to inhibit innovation, we do not want to prescribe set standards and practices that could become quickly outdated. Instead, we ask that you answer questions that address specific aspects of creating and managing digital products. Like all components of your IMLS application, your answers will be used by IMLS staff and by expert peer reviewers to evaluate your application, and they will be important in determining whether your project will be funded.

Instructions
You must provide answers to the questions in Part I. In addition, you must also complete at least one of the subsequent sections. If you intend to create or collect digital content, resources, or assets, complete Part II. If you intend to develop software, complete Part III. If you intend to create a dataset, complete Part IV.

PART I: Intellectual Property Rights and Permissions

A.1 What will be the intellectual property status of the digital products (content, resources, assets, software, or datasets) you intend to create? Who will hold the copyright(s)? How will you explain property rights and permissions to potential users (for example, by assigning a non-restrictive license such as BSD, GNU, MIT, or Creative Commons to the product)? Explain and justify your licensing selections.

The PDF version of the primer we plan to create will be licensed under the Creative Commons BY-NC-ND option, which allows for download and sharing of the material as long as proper credit is given, and prohibits changes from being made to the material.

A.2 What ownership rights will your organization assert over the new digital products and what conditions will you impose on access and use? Explain and justify any terms of access and conditions of use and detail how you will notify potential users about relevant terms or conditions.

The University of Washington will hold the rights to modify the primer, once created. The PDF and webpages created will be open access and available for download by all.

A.3 If you will create any products that may involve privacy concerns, require obtaining permissions or rights, or raise any cultural sensitivities, describe the issues and how you plan to address them.

There are no privacy concerns regarding this material.

Part II: Projects Creating or Collecting Digital Content, Resources, or Assets

A. Creating or Collecting New Digital Content, Resources, or Assets

A.1 Describe the digital content, resources, or assets you will create or collect, the quantities of each type, and format you will use.

The digital content for this project will include 3-6 webpages that will be located on the University of Washington Health Sciences Library (UW HSL) website, and a 10-12 page PDF that will be available for download from the website.

A.2 List the equipment, software, and supplies that you will use to create the content, resources, or assets, or the name of the service provider that will perform the work.

The PDF primer will be designed by Felicity Brigham, a graphic designer for Visual Design & Production at UW Health Sciences Academic Services & Facilities. The primer content will be written by a team of UW HSL librarians and medical virtual reality experts, including Ryan James, Dmitry Levin, and Dr. Beth Ripley. The webpages will be designed by Adam Garrett and Deric Ruhl of the UW HSL.

A.3 List all the digital file formats (e.g., XML, TIFF, MPEG) you plan to use, along with the relevant information about the appropriate quality standards (e.g., resolution, sampling rate, or pixel dimensions).

The downloadable primer will be in Portable Document Format (PDF). The webpages will be designed and hosted on Wordpress. The digital version of the logo will be an Adobe Illustrator (AI) file.

B. Workflow and Asset Maintenance/Preservation

B.1 Describe your quality control plan (i.e., how you will monitor and evaluate your workflow and products).

There will be regular bimonthly meetings throughout the project to assess the workflow and progress.

B.2 Describe your plan for preserving and maintaining digital assets during and after the award period of performance. Your plan may address storage systems, shared repositories, technical documentation, migration planning, and commitment of organizational funding for these purposes. Please note: You may charge the federal award before closeout for the costs of publication or sharing of research results if the costs are not incurred during the period of performance of the federal award (see 2 C.F.R. § 200.461).

Our PDF will be deposited in the University of Washington data repository, ResearchWorks Archive. The webpages will contain the same information, and will be hosted on the HSL website for as long as they remain relevant.

C. Metadata

C.1 Describe how you will produce any and all technical, descriptive, administrative, or preservation metadata. Specify which standards you will use for the metadata structure (e.g., MARC, Dublin Core, Encoded Archival Description, PBCore, PREMIS) and metadata content (e.g., thesauri).

The metadata standard required by the UW digital repository is Dublin Core. Much of the metadata is automatically generated by the software used by the ResearchWorks Archive. Other required metadata such as title, author, and date will be produced by the UW HSL staff.

C.2 Explain your strategy for preserving and maintaining metadata created or collected during and after the award period of performance.

Metadata on the primer is expected to be fairly static, because it is a digitized print document. The metadata for the PDF will be preserved in the ResearchWorks Archive along with the PDF itself.

C.3 Explain what metadata sharing and/or other strategies you will use to facilitate widespread discovery and use of the digital content, resources, or assets created during your project (e.g., an API [Application Programming Interface], contributions to a digital platform, or other ways you might enable batch queries and retrieval of metadata).

The primer PDF will be freely available for download on the UW HSL website, which will make it discoverable via major search engines such as Bing and Google. Important metadata will be embedded in the PDF itself.

D. Access and Use

D.1 Describe how you will make the digital content, resources, or assets available to the public. Include details such as the delivery strategy (e.g., openly available online, available to specified audiences) and underlying hardware/software platforms and infrastructure (e.g., specific digital repository software or leased services, accessibility via standard web browsers, requirements for special software tools in order to use the content).

Both the PDF and webpages will be freely available to the public online. They will be accessible via standard web browsers.

D.2 Provide the name(s) and URL(s) (Uniform Resource Locator) for any examples of previous digital content, resources, or assets your organization has created.

Response & Recovery App in Washington (rrain.org)
Translational Research and Information Lab (hsl.uw.edu/trail)
Health Evidence Resource for Washington State (heal-wa.org)
EthnoMed (ethnomed.org)

Part III. Projects Developing Software

A. General Information

A.1 Describe the software you intend to create, including a summary of the major functions it will perform and the intended primary audience(s) it will serve.

N/A

A.2 List other existing software that wholly or partially performs the same functions, and explain how the software you intend to create is different, and justify why those differences are significant and necessary.

N/A

B. Technical Information

B.1 List the programming languages, platforms, software, or other applications you will use to create your software and explain why you chose them.

N/A

B.2 Describe how the software you intend to create will extend or interoperate with relevant existing software.

N/A

B.3 Describe any underlying additional software or system dependencies necessary to run the software you intend to create.

N/A

B.4 Describe the processes you will use for development, documentation, and for maintaining and updating documentation for users of the software.

N/A

B.5 Provide the name(s) and URL(s) for examples of any previous software your organization has created.

N/A

C. Access and Use

C.1 We expect applicants seeking federal funds for software to develop and release these products under open-source licenses to maximize access and promote reuse. What ownership rights will your organization assert over the software you intend to create, and what conditions will you impose on its access and use? Identify and explain the license under which you will release source code for the software you develop (e.g., BSD, GNU, or MIT software licenses). Explain and justify any prohibitive terms or conditions of use or access and detail how you will notify potential users about relevant terms and conditions.

N/A

C.2 Describe how you will make the software and source code available to the public and/or its intended users.

N/A

C.3 Identify where you will deposit the source code for the software you intend to develop:

Name of publicly accessible source code repository:N/A

URLN/A

Part IV: Projects Creating Datasets

A.1 Identify the type of data you plan to collect or generate, and the purpose or intended use to which you expect it to be put. Describe the method(s) you will use and the approximate dates or intervals at which you will collect or generate it.

N/A

A.2 Does the proposed data collection or research activity require approval by any internal review panel or institutional review board (IRB)? If so, has the proposed research activity been approved? If not, what is your plan for securing approval?

N/A

A.3 Will you collect any personally identifiable information (PII), confidential information (e.g., trade secrets), or proprietary information? If so, detail the specific steps you will take to protect such information while you prepare the data files for public release (e.g., data anonymization, data suppression PII, or synthetic data).

N/A

A.4 If you will collect additional documentation, such as consent agreements, along with the data, describe plans for preserving the documentation and ensuring that its relationship to the collected data is maintained.

N/A

A.5 What methods will you use to collect or generate the data? Provide details about any technical requirements or dependencies that would be necessary for understanding, retrieving, displaying, or processing the dataset(s).

N/A

A.6 What documentation (e.g., data documentation, codebooks) will you capture or create along with the dataset(s)? Where will the documentation be stored and in what format(s)? How will you permanently associate and manage the documentation with the dataset(s) it describes?

N/A

A.7 What is your plan for archiving, managing, and disseminating data after the completion of the award-funded project?

N/A

A.8 Identify where you will deposit the dataset(s):

Name of repository: N/A

URL: N/A

A.9 When and how frequently will you review this data management plan? How will the implementation be monitored?

N/A