

Harvard University Graduate School of Design
Building for Tomorrow: Collaborative Development of Sustainable Infrastructure for
Architectural and Design Documentation abstract

Abstract

Building for Tomorrow: Collaborative Development of Sustainable Infrastructure for
Architectural and Design Documentation

The use of 2D and 3D CAD and Building Information Modeling (BIM) software is now routine in architecture and design firms and in design education programs. CAD is particularly problematic for the libraries, museums, and archives responsible for long term management of design documentation since CAD is highly volatile, relying on proprietary mathematical algorithms to represent shapes and structures, and packaged in complex, proprietary, and rapidly evolving software products which are expensive, digitally encrypted and obsolete within years; a digital preservationist's worst nightmare. Architectural museums and archives are faced with a rapidly growing need to preserve digital information and are grappling with the need for technological tools, technical expertise in digital preservation, AutoCAD expertise, archival expertise, and the need for repositories that can preserve and disseminate the archived data.

The Frances Loeb Library at the Harvard University Graduate School of Design requests the support of IMLS for a National Forum Grant under the National Digital Platform funding priority to support two priority-setting meetings of engaged stakeholders – architects, architectural historians, archivists, librarians, technologists, digital preservationists, and others who will frame a national/international collaborative infrastructure to support long-term preservation of digital design data, specifically in the architecture and design fields. The first meeting is a day and a half long Forum; the second meeting is for a steering committee to prioritize and develop a project plan that results from the Forum. The forum will provide a venue for the diverse group of stakeholders to think collaboratively about the issues in preserving architectural design data, to find alignments across communities, and to identify the needs required to develop an infrastructure to support archiving of digital design information that will be usable by a variety of types and sizes of architectural museums and archives. A second action from the meeting will include the formation of a Steering Committee that will commit to take the results of the Forum forward. The second proposed meeting will be comprised of the Steering Committee, who will refine the work plan, define a set of achievable activities, identify resources required to take action, and to develop a dissemination plan for the results of the work undertaken in this grant.

The progress made during this one-year planning grant will benefit every archivist, architect, and library and archive in the country and internationally, and many more librarians and museum curators along the way. The consensus-building and collaborative work during the Forum will build a foundation and clear path towards development of a shared infrastructure for digital preservation of architectural documentation that informs digital preservation work for all types of files and across all subject domains.

Ann Whiteside is the Principle Investigator (PI) for this project. Ms. Whiteside is Librarian/Assistant Dean for Information Services, and a lecturer at the Harvard University Graduate School of Design (GSD).

Statement of National Need

Since the introduction of Computer Aided Design (CAD) software in the 1960s, industries that design and develop our built environment have been moving from pencil and paper to computers and digital files. The earliest adopters of the new technology were industries like aerospace and automotive, and since then the fields of architecture and design have been enthusiastic adopters. CAD has allowed architects to take previously unimaginable risks in their designs, and to experiment with new forms and materials without the need of building prototypes or performing expensive structural analyses until much later in the process. U.S. architects like Frank Gehry led the way, and schools of architecture have been providing the educational programs and technical expertise to marry architecture, engineering, software design. That this has led to a new generation of architects leveraging the technology, and to a number of buildings that they have designed, is well known.

The use of 2D and 3D CAD and Building Information Modeling (BIM) software is now routine in architecture and design firms. Furthermore, the contractual deliverable is shifting from printed, wet-signed and wet-stamped drawing sets to an electronically signed model that can be manipulated to achieve equal, if not more, granular information than the traditional printed plans.

In architecture and design projects, there are many types of digital files produced during design and construction that are important for long-term preservation for future renovations/restorations and scholarly research. In addition to 3D CAD models there are hundreds or thousands of detailed 2D layer drawings produced for particular aspects of a building; there are 3D printed objects; there are project “out-puts” – for example, drawings or sketches of the building. There are photographs and videos of the construction site, websites about the building, BIMs, and other multimedia related to the project; there are copious communications among architects, clients, contractors and other parties, including email, contracts, specifications, RFIs (requests for information) and ASIs (architect’s supplemental instructions). To preserve the records of significant building projects completely, all of this digital information should be captured and linked or packaged together into a collection that can be easily searched, navigated, and preserved over time.

Over the last five years, we are seeing that students in architecture and design schools are further routinely using CAD for modelling, skipping the 2D drawing process entirely, meaning that the coming generation of architects will be only producing documentation in 3D models, providing more urgency to the problem of preserving this type of documentation.

The impact of this on the record of architectural innovation and practice –in architecture libraries, archives, museums, among others–is only beginning to be appreciated. No longer can libraries acquire blueprints or drawings, a few images, and a scale model or two, to represent a major work of architecture in their collections. Now they must acquire the 3D CAD models and 2D drawing files, Building Information Models (BIM), digital images, videos and documents, all delivered on a computer hard drive often with no annotation whatsoever. No library or archive is currently prepared for this new reality, but they are increasingly under pressure to figure out how to acquire these 21st century collections, to support the next generation of architectural students and historians.

CAD is particularly problematic for the libraries, museums, and archives responsible for long term management of design documentation since CAD is highly volatile, relying on proprietary mathematical algorithms to represent shapes and structures, and packaged in complex, proprietary, and rapidly evolving software products which are expensive, digitally encrypted and obsolete within years; a digital preservationist's worst nightmare. Fortunately the standards for CAD are moving forward, so that options are emerging to represent CAD drawings and models in ways that achieve a degree of "interoperability" across systems and time. These standards are complex and offer many trade-offs among them. Different software programs support different standards, and each standard supports different aspects of the represented design. In addition to simply capturing these digital design files, archiving this material raises a host of questions about what purposes the digital designs should serve, their authenticity, and how to technically manage such assets in the digital future.

There are multiple CAD software vendors that supply the architecture, engineering, and construction industry including Autodesk, Inc., Bentley Systems (Microstation), Dassault Systems (CATIA), and others. As with all digital software, file format obsolescence is a barrier to our ability to archive many digital design files. Over the last fifteen years, the risk of losing this portion of our digital cultural heritage has grown tremendously. The loss is a global issue, and as such should be addressed collaboratively across multiple international institutions, bringing together the expertise of all stakeholders and to leverage digital curation and preservation practice with design principles to collaboratively forge a compliant and sustainable infrastructure to continually identify opportunities and solutions to address challenges.

Architectural museums and archives are faced with a rapidly growing need to preserve digital information and are grappling with the issues of the need for technological tools, the need for technical expertise in digital preservation, AutoCAD expertise, archival expertise, and the need for repositories that can preserve and disseminate the archived data.

Without a collaborative infrastructure to support the preservation and documentation of this digital content, we will lose a significant portion of our cultural heritage. By working across domains and using expertise across domains – architecture, architectural history, archives and libraries, digital preservation, and the CAD software industry – we will be able to develop infrastructure and practices that will preserve this portion of our cultural heritage.

There is a history of work that has been done in this area over the last 15 years that leads us to this moment. The curatorial Department of Architecture at the Art Institute of Chicago undertook a study in 2003 to identify requirements for creating and maintaining an archive of born-digital objects, with Kristine A. Fallon as principle investigator. The study's Advisory Committee consisted of senior representatives of leading archival institutions, universities with advanced programs in computer-aided design, technology vendors, and architects and industrial designers.

The first step of the study was to understand how design firms are currently using digital design tools, what types of digital design data are being produced and how central digital design data are to understanding the design process. In-depth case studies of projects ranging in scale from industrial design to urban design at nine

design firms were conducted. The case studies showed that digital design tools are integral to the design process and that digital images are central to design decision-making.

The second step was to validate that findings in the case studies could be extrapolated to the broader design community. This was done via an international survey, asking design firms how they used digital design tools, how important the tools were to their practices and which products they used. Survey results confirmed findings in the case studies.

The team also conducted research into prior archiving projects and existing standards, methodologies and products for collecting and archiving digital design data. It was found that no museum or archival institution had solved the key problem of ensuring long-term preservation of the numerous and rapidly changing data formats.

Based on the Open Archival Information System (OAIS) reference model for a long-term data repository system (ISO 14721:2002), the team identified six distinct stages of the workflow for bringing digital design data from design office to museum archive and for making it accessible to the public.

The report of the study included recommendations on procedures and technology and related requirements, and a start-up plan. The [full report](#) provides more information.

In 2007, the MIT Libraries was awarded an IMLS grant to develop a practical strategy for processing and preserving the digital outputs of architectural projects involving 2D and 3D and other digital files. The Future Proofing Architectural Computer-Aided Design (FACADE) project worked with design data from Frank Gehry, Moshe Safdie, and Thom Mayne. It explored how to relate 3D designs with related 2D drawings, digital images and videos, email and other communications, and with BIMs. The specific research questions addressed included: what techniques should be applied to preserve native CAD models over archival timeframes? Is it necessary to preserve software, or is an emulation framework required? What additional process information is required to capture the building lifecycle and how can that be stored in digital archives? What other annotations need to be supported to retain architect's intentions and instructions to contractors and subcontractors who do the construction and how should this information be kept? How do we archive this information into digital preservation repositories and make it accessible?

Five major deliverables were defined for the project: analysis, identification, and description of major CAD formats; analysis, design, and implementation of native CAD file ingestion, management, preservation, and dissemination practices; analysis and recommendation related to process documentation (relationships between various CAD files and versions, and between CAD files and other documentation; documentation, training, outreach, and dissemination of results to the digital library, digital preservation, and DSpace communities.

The project also produced a prototype archive for the material using DSpace, with the intent of sharing a system with other institutions, allowing collaboration across institutions. Through community discussions, it was clear that many institutions, especially smaller ones, are often lacking technical infrastructure and

expertise to implement the model developed by the FACADE team. The [final report](#) offers further information about the project.

The Society of American Archivists Architectural Records Roundtable launched a CAD/BIM Task Force in 2013 as a catalyst for a community-wide initiative to address the numerous (legal, technical, and curatorial) issues of born-digital architectural records. The work of the task force to date includes a survey of firms and architectural archives to learn about holdings and current archival practices for born digital design data, a [Born Digital Studies Bibliography](#), and a [report](#) of the task force.

In September 2014, the International Confederation of Architectural Museums (ICAM) held its conference in Montreal and New York. The opening session was devoted to the topic of archiving born digital architectural materials. The questions the session sought to answer included: How can we, as curatorial and archival institutions, address the need to archive digitally? How can we collect, ingest and make data accessible for our public and researchers? What are the implications of collecting and archiving recent architectural production? What instruments can we use? What software and/or hardware is required to read digital material? What expertise do we need and how do we determine what we need to collect?

Representatives from five international institutions of varying sizes discussed the topic and highlighted efforts at institutional levels to deal with digital design data. The institutions were Cité de l'architecture et du patrimoine, Paris; Harvard University, Cambridge, MA; Royal Institute of British Architects, London; Centre for Flemish Architectural Archives, Antwerp; and the Canadian Centre for Architecture, Montreal. Issues discussed included collecting, software, and tools for archiving and description. It also made clear that the complexity of the problem is one that cannot be addressed institution by institution, but rather collaboratively across institutions large and small at the national and international level.

Previous work done in the area of archiving digital design information, and current work in multiple architectural institutions is evidence of the growing need to bring digital design data into the national and international digital preservation conversation, to identify those collaborative and interoperable tools already in existence that support the preservation of digital cultural heritage that are accessible to institutions of all sizes. Further, over the time of the work that has previously been accomplished the various communities are recognizing that the need to address the issues are pressing as we lose vital cultural heritage information. We have also seen huge strides in the digital preservation realm that will support the work that needs to be done.

Project Design

To meet these needs, the Frances Loeb Library at the Harvard University Graduate School of Design seeks the support of IMLS for a National Forum Grant under the National Digital Platform funding priority to convene two priority-setting meetings of engaged stakeholders – architects, architectural historians, archivists, librarians, technologists, digital preservationists, and others who will frame a national/international collaborative infrastructure to support long-term preservation of digital design data, specifically in the architecture and design fields. The infrastructure includes the ongoing integration of knowledge, technologies, and management across generations of technology and practice. The first meeting is a day and a half long Forum; the second meeting is for a steering committee to prioritize and develop a project plan that results from the Forum.

The goals of the proposed one and a half day forum and following steering committee work are to bring the communities of expertise (architecture, architectural history, archives and libraries, technologists, digital preservation, software industry, and intellectual property) together to collaboratively develop a shared solution for archiving digital architectural documentation. The forum will provide transformative thinking about the preservation of architectural archives as a global issue, rather than an institutional issue; the forum will foster collaborations between architects and libraries, museums, and archives, technologists, and digital preservationists that will allow us to move to a shared infrastructure that supports a National Digital Platform for cultural heritage materials. The forum will provide a venue for the diverse group of stakeholders to think collaboratively about the issues in preserving architectural design data, to find alignments across communities, and to identify the needs required to develop an infrastructure to support archiving of digital design information that will be usable by a variety of types and sizes of architectural museums and archives.

The forum will be held as a pre-conference meeting of the Society of Architectural Historians in April 2018 in St. Paul, Minnesota. Invited guests from stakeholder organizations will include representatives from the Harvard University Graduate School of Design (Andrew Witt, Assistant Professor in Practice of Architecture) ; the Society of Architectural Historians (Pauline Saliga, Executive Director and Victoria Young, Professor and Chair of Art History, University of St. Thomas); the Society of American Archivists, Architectural Archives Roundtable (Aliza Leventhal) the American Institute of Architects (Nancy Hadley); librarians and archivists from architectural archives of varying sizes (Pamela Casey, Architecture Archivist, Drawings and Archives Collection, Avery Architectural and Fine Arts Library, Columbia University), UC Berkeley Environmental Design Archive (Waverly B. Lowell, Curator), Art Institute of Chicago (Nathaniel Parks), the Royal Institute of British Architects (Kurt G.F. Helfrich); the Canadian Centre for Architecture (Martien deVletter); Rhode Island School of Design (Mark Pompelia); Cambridge (MA) Historical Commission (Charles Sullivan); Saskaki Associates; PennDesign, University of Pennsylvania (William Whitaker); Southeastern Architectural Archive, Tulane University (Kevin Williams); Library of Congress (Caroline Arms of “Sustainability of Digital Formats”); the Digital Library Federation (Dr. Bethany Nowviskie) ; digital preservation organizations including the Software Preservation Network (SPN) (Jessica Myerson), AVPreserve (Bertram Lyons) the Digital Preservation Network (DPN) (Mary Molinaro); technologists from the library and archival communities (McKenzie Smith, University Librarian at UC Davis; Nancy McGovern, Director, Digital Preservation, MIT Libraries); intellectual property experts; DURAARK (Durable Architectural Knowledge)(Stefan Dietze); the software vendor community, including Autodesk, Inc. (Jeremy Carter); BitCurator (Christopher (Cal) Lee); DPLA; HathiTrust (Mike Furlough); CNI; and IMLS.

In preparation for the forum, a small group will work on two tasks. One is a series of conversations with stakeholders; the second is to plan the agenda and structure of the forum. One-on-one conversations with semi-structured questions will be conducted with representative stakeholders – AutoDesk, architects, historians, archivists from small, medium, and large sized institutions, and preservation technologists – to understand the critical points of need across a broader community. The conversations will identify topics of commonality and will focus the forum’s agenda on the priorities, needs, opportunities, and challenges that will populate the resulting action agenda for a collaborative infrastructure. The results of the one-on-one conversations will inform the content and logistics of the forum, which will include identification of what is needed to solve the range of issues (the state of digital design data, barriers to archiving, software industry

practices, intellectual property, digital preservation, preservation tools and archiving tools), and to identify tools and standards already in existence that can align with the community's needs. For the small archives and societies that manage architectural files, this pre-work will also inform the specific barriers to participation in collaborations such as this, so that these issues can specifically be taken into account as part of the planning of an infrastructure. This pre-work will be key to ensuring that there is understanding of the specific tools, workflows, and standards that are necessary to adopting a lifecycle approach to the preservation of digital architectural information, from the moment of conception through preservation and dissemination. Understanding these needs will inform an approach to building a collaborative infrastructure and will help to ensure that the various communities can participate in the development of an infrastructure.

Participants in the forum will be actively engaged in identifying the needs for a collective infrastructure through discussions on specific topics and breakout sessions that will identify the state of digital design data, barriers to archiving, software industry practices, intellectual property, the field of digital preservation and standards, preservation tools and archiving tools, and identify tools and standards already in existence that can align with this community's needs. This will provide information about where collaboration across expertise domains can work together and the standards that will be needed, leading to the basis for the development of a roadmap for building a national/international infrastructure.

A second action from the meeting will include the formation of a Steering Committee, comprised of up to nine people self-identifying as willing to move things forward by developing an action plan of immediate next steps required to move this initiative forward. The second proposed meeting will be comprised of the Steering Committee, who will refine the work plan, define a set of achievable activities, identify resources required to take action, and to develop a dissemination plan for the results of the work undertaken in this grant. This meeting will be convened in May 2018, and will be held at the Harvard University Graduate School of Design. The work plan will include identifying specific tools that may be used to for collecting, describing, managing data files; identifying and disseminating standards for preservation; a process for removing barriers to intellectual property issues; and the appropriate types of organizations to support the effort. Such a set of tools will provide an infrastructure that can be used by architectural practitioners to manage their working files, as well as by cultural heritage repositories and can be shared across communities and institutions of all sizes. An important outcome of this forum and roadmap development will be to ensure that such a collaborative infrastructure is easy and financially viable for all sizes of institutions.

The proposed small forum planning group will include Principle Investigator Ann Whiteside; Andrew Witt, architect and professor of practice at the Harvard University Graduate School of Design; Nancy McGovern, digital preservationist at MIT; Pauline Saliga, representing the Society of Architectural Historians; Aliza Leventhal, archivist at Sasaki Associates, Boston, MA; Jessica Meyerson, Digital Archivist at the Dolph Briscoe Center for American History and the Software Preservation Network. Each of these individuals brings expertise in both their professional domains and in bringing together diverse communities to work on collaborative projects. The members of the group will provide different perspectives on the communities we want to engage, and will assist in reaching out to these communities as part of the pre-forum work. The results of the one-on-one conversations will allow this group to craft a meaningful agenda for the Forum itself.

The Building of Tomorrow project supports the IMLS goal of supporting exemplary stewardship of museum and library collections and promoting the use of technology to facilitate discovery of knowledge and cultural heritage. The goals of the proposed one and a half day forum and later steering committee work are to bring the communities of expertise together to collaboratively develop a shared solution for archiving digital architectural documentation that will result in the ability for institutions of all types and sizes to provide exemplary stewardship of architectural collections through the development and use of technology to support digital preservation, and later access to the digital content. The pre-Forum one on one conversations will allow us to tailor the agenda of the Forum to meet stakeholder needs and address issues. The plan of action developed in the Forum itself that will outline needs and next steps to achieve those identified needs will be one measure of the success of the forum. Primary beneficiaries of the forum will be the communities represented in attendance. The difference that this project will make in the long history of the topic is that we will leave the forum and following steering committee meeting with a series of next steps that will provide a roadmap of actions to begin to build a collaborative infrastructure. After the Forum, attendees will be asked to provide input on the value of the Forum through a survey. The PI and the Graduate Student Coordinator will work with a usability consultant at Harvard Library to develop the survey instrument.

The results of the Forum will be disseminated through the Building of Tomorrow website and articles in open access repositories and journals and conference presentations at venues such as SAA, SAH, and CNI. The planning group will also submit a proposal to the SAA Research Forum to present the results of the Forum and intended action plan for review and feedback from attendees. The Research Forum has been running for more than a decade and has featured presentations by many of the major projects in the digital curation and preservation communities. <http://archivists.org/proceedings/research-forum>

National Impact

The progress made during this one-year planning grant will benefit every archivist, architect, and library and archive in the country and internationally, and many more librarians and museum curators along the way. The consensus-building and collaborative work during the Forum will build a foundation and clear path towards development of a shared infrastructure for digital preservation of architectural documentation that informs digital preservation work for all types of files and across all subject domains. A shared infrastructure, including standards, will provide technological support for all types of libraries, archives, historical societies that have digital files to manage. This will be an enormous contribution to the fields of libraries and archives where the standards are just emerging, and at the same time the voluminous number of digital files are already coming to archives and libraries to manage. The development of a shared infrastructure that is financially viable and technology easy to access and use will transform the ability for institutions of any size to manage their digital content.

Implementation of the development plan for building a collaborative infrastructure will be dependent upon continued collaboration across the domains that will attend the forum. Agreements for collaboration will need to be made to ensure ongoing commitment to work on building an infrastructure. It is becoming clear that the incentives for collaboration on this issue are strong, and many pieces of the infrastructure are coming into place, making this the right moment to move forward with this initiative.

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.

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.

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.

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.

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.

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).

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).

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).

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).

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

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).

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).

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.

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.

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.

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.

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

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

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

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

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.

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

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

Name of publicly accessible source code repository:

URL:

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.

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?

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).

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.

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).

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?

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

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

Name of repository:

URL:

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