WORKSHOP DISCUSSION DRAFT 1.0
BAMBOO PROGRAM DOCUMENT

This document is version 1.0 of the Workshop Discussion DRAFT of the Bamboo Program and shall be used as the basis for work in Workshop 4. The purpose of this document is to frame a dialog among participants and as such, share preliminary and provisional information regarding the Bamboo Program. This will allow institutions and organizations participating in the Bamboo Planning Process to help determine (1) the long term future of Bamboo and, most importantly, (2) define what activities Bamboo will carry out in its first three year implementation phase (from 2010-2012). Unlike previous versions, this draft is designed to solicit input from the participants taking part in Bamboo Workshop 4. Changes, edits and recommendations collected at and immediately after Workshop 4 shall be incorporated into the Bamboo Program Document v1.1.

Please note that we are updating this document frequently based on wide ranging input from the Bamboo community. These updates are indicated as ".1", ".2", ".3", etc updates. In addition, we will occasionally make major document revisions. These are noted as "1.X", "2.X", and so forth. Between major document revisions there may be some inconsistencies in language used between the sections of the document.

The content and direction expressed within the sections of this document shall be considered as provisional and will be subject to potentially substantial change between this version and the final edition of the Bamboo Program slated for release in Fall 2009.

OVERVIEW

1. VISION

What are the major opportunities and problems that the Bamboo Community is addressing, and what is the future we wish to create for higher education institutions working together to support teaching and research in the arts, humanities, and interpretive social sciences.

2. SCOPE OF WORK

Bamboo is different from most community development efforts in that it is not striving to create a single application nor a suite of software. Instead, the scope of Bamboo and the program of work is centered around creating cyberinfrastructure and with that, shared capacity within, across, and between institutions to better enable and foster innovation in the arts, humanities, and social sciences. Components, clouds, collaborations, and communities are all part of the scope of Bamboo.

MAJOR ACTIVITIES

3. THE FORUM

- 3.1. SCHOLARLY NETWORK
  The virtual place for people to discover, explore, and connect with other people and groups across the Bamboo community. The Bamboo Scholarly Network may be implemented through interconnecting existing social networking tools, including the use of plug-ins and/or widgets based on open interface standards that will allow the Scholarly Network to be easily incorporated into existing portals, virtual research environments, or other research workflow systems and tools.

- 3.2. SCHOLARLY NARRATIVES
  A growing body of scholars' stories about the use of digital technologies across the arts, humanities, and interpretive social sciences. These narratives serve as one critical entry point for learning what can be done and for rapidly sharing updates on work in progress. This Scholarly Narratives hub will interconnect with digital Recipes, Tools Guide, Educational Materials, and Services Atlas described below.

- 3.3. RECIPES (WORKFLOWS)
  The Scholarly Narratives are the stories scholars told about what they wanted to do with technology in their research and teaching and Recipes draw on the narratives to propose general tasks that scholars want to accomplish with information technology. The Recipes draw on examples and describe a generalized way (a workflow) of doing something important to a scholar. Recipes are assembled and described by a community of scholarship that includes faculty, librarians, and/or technology support-staff who both use the technology and support research, teaching, learning, and scholarship. In essence, Recipes are distillation of the Bamboo Community's ideas around how to best accomplish real academic tasks.

- 3.4. TOOLS AND CONTENT GUIDE
  The guide allows one to both publish information about, and to discover, tools and content sources that are of value for research and teaching. Scholarly Narratives and Recipes will draw from and point to this community annotated list of tools and content resources. This registry becomes another "view," like that of the Scholarly Network, Narratives, and Recipes, on what is possible and what materials are available to help.

- 3.5. OTHER EDUCATIONAL AND CURRICULAR MATERIALS
  A place for the dissemination and discussion of other related educational and curricular materials that can help students, faculty, library and technology professionals, and others to best integrate developing digital content and tools into

researching, teaching, and public service.

- 3.6. Bamboo Community Environment(s)
  The environment where Scholarly Network, Narratives, Recipes, Tools/Content Guide, Educational Materials can be found. The environment may take two general forms: (1) as a user interface that Bamboo develops and is run for the community and/or (2) by developing each of these elements as information widgets/gadgets that can be incorporated into existing Virtual Research and Collaborative Environments.

4. The Cloud

- 4.1. Services Atlas
  The Services Atlas records and delivers community input (Scholarly Narratives, Recipes, Activities, Tool examples, Content/Resource examples, Service Families, Service Candidates, Service Contracts, and extant Services - including community-contributed references to information outside the formal bounds of Bamboo) in easily updated, linked, annotatable forms that may be mixed, matched, categorized, and re-categorized in order to render the community's understanding of scholarly practice accessible from the multiple perspectives of diverse stakeholders native to Bamboo. Dynamic ability to incorporate and view evolving input and analysis, and quickly and clearly draw connections to broader context, will benefit faculty, librarians, funders, institutional leaders, technical architects, and service developers. These varied views of a changing landscape will enable informed governance by key stakeholders in_ arts, humanities, and qualitative social sciences scholarship. The services atlas is not a user interface, web page, or application; it is exposed as a set of services that may be presented in a tool, page, portal, or interface of one's choice, including but not limited to the Bamboo Exchange.

- 4.2. Bamboo Exchange
  The Bamboo Exchange will serve as a focal point for information about services, tools, and content, including but not limited to services incorporated in the Service Atlas; and as a venue for resource exchange between marketplace participants. Incentives to participate in this marketplace will include a community-driven award system (including monetary rewards), expanded metrics about the way services are used by scholars and campuses, publicity, channels of communication to and feedback from the community of institutions and disciplines participating in Bamboo, as well as an avenue for access to Bamboo's experimental "incubator" service-deployment platform (cf. Local and Incubator Services).

- 4.3. Shared Services Lifecycle
  Sub-section 4.3.1, "Local and Incubator Services," describes early phases of discovery, adoption, or development of services of interest to the Bamboo Community. Sub-section 4.3.2, "Common Services," describes a phase of service

refinement that addresses concerns like sustainability, standards-compliance, and reliability. Sub-section 4.3.3, "Bamboo Service-Delivery Appliances and the Bamboo Cloud," describes how Bamboo intends to make services available for use.

- 4.4. Tool and Application Alignment Partnerships
  Bamboo will partner with interested tool and application projects and developers to wrap and/or deliver functionality (automation capabilities) as services that can be deployed alongside, and interoperate with, Bamboo Common Services. By exposing capabilities from other projects and providers as Bamboo-affiliated services, broader and more diverse uptake of those capabilities is more likely; such exposure will also enrich the pool of service candidates being considered for refinement into Bamboo Common Services. These partnerships will deepen and broaden the Bamboo ecosystem with expertise and experience rooted in domain- and function-centric communities.

- 4.5. Content Interoperability Partnerships
  Bamboo will partner with interested content (digital resource) providers to enable Bamboo Common Services to discover, search, and appropriately operate on their diverse and distributed holdings. Similarly, partnerships with interested repository platform providers will enable Bamboo Common Services to discover, search, and appropriately operate on resources hosted on platforms of strategic value to communities of arts, humanities, and qualitative social science scholarship. These efforts will likely take the form of modeling, implementing, and deploying service interfaces that conform to extant and emerging standards to expose strategically identified content stores and platforms. Bamboo-facilitated exposure of content via service interfaces will broaden uptake and trans-disciplinary opportunities for scholarship, as well as suggest additional candidates for refinement into Bamboo Common Services.

5. Bamboo Labs

- 5.1. Diversity, Innovation and Labs
  Bamboo establishes and maintains a community of individuals, projects, and institutions that are interested in working together while also providing the administrative support and organizational context for the ongoing effort. Within the larger organization are the individual projects and diverse activities that ultimately define Bamboo.

- 5.2. An Ecosystem of Projects and Initiatives
  Bamboo is much more than a cyberinfrastructure, e-research, or e-infrastructure initiative; it represents a range of interlinked activities, individual projects, and related endeavors that form an ecosystem of collaborative effort. It exists within an even larger macroecology of academic disciplines, professional fields, and technical environments. As such, it is important that Bamboo strives to fit in

wherever possible as it is a component of a larger array of systems and ecologies.

- 5.3. Structure
  Bamboo is structured around three clusters of activity: Bamboo Explore, Bamboo Plan, and Bamboo Build. These three structures provide the context for labs to be created, sustained, and delivered.

- 5.4. Liaisons
  An important aspect to Bamboo is its ability to formally liaise with other organizations, consortia, projects and initiatives in order to share ideas, minimize duplication of effort, and promote the use of already established standards, specifications, and practices. Although numerous informal connections undoubtedly exist between participants in the Bamboo Community, formal liaison relationships are necessary to connect Bamboo activities with the work of other groups.

- 5.5. Governance
  The governance model for Bamboo is based on a moderately decentralized approach of three leadership committees (one for each area of Explore, Plan, Build), a Bamboo Board that has representatives from the leadership committees and the broader community, and an executive director that is part of an overall Bamboo Office.

Supplementary Material

6. Appendices

- 6.1. Scholarly Practices
- 6.2. Services Atlas
- 6.3. Planning Project Participants
- 6.4. Planning Project Demonstrators

7. Glossary

Overview

Executive Summary

To be written at a later date.

1. Vision

1.1 Overview

> *Veniet tempus quo posteri nos tam aperta nescisse mirentur.*
>
> *(The time will come when our descendants marvel that we did not know such evident things.) — Seneca*

Bamboo is a multi-institutional, interdisciplinary, and inter-organizational community that brings together researchers and educators, computer scientists and domain specialists, librarians and information technologists, technology professionals and information scientists, and other individuals and groups to develop and apply shared technology services in order to advance research and learning in the arts, humanities, and interpretive social sciences. By building a sustainable community of collaborators within and across campuses and organizations (hereafter referred to as the Bamboo Community), we can collectively share knowledge and develop technology across the diverse range of disciplines and fields within the community in order to benefit not only the participants, but scholars and learners worldwide. The breadth of Bamboo is quite large so throughout this document, "humanities" and the "arts and humanities" are used interchangeably and as shorthand to refer to the collection of disciplines and fields that fall under the arts, humanities, and interpretive social sciences.

The Bamboo approach is rooted in creating, reusing, remixing, and sharing technology services and digital content across project, institutional, organizational, regional, and national boundaries. Members of the Bamboo Community believe that if we share technologies and content in common ways, we will be able to:

- increase the potential for greater scholarly innovation as more effort can be placed on new ideas rather than recreating existing solutions;
- reduce the overall effort in the long term to create and sustain new digital projects;
- take best advantage of specialized skill sets across the various communities to solve problems;
- leverage institutional and community-wide economies of scale to tackle problems and sustain critical projects; and
- share solutions and expertise across all disciplines: the sciences, quantitative social sciences, and arts and humanities.

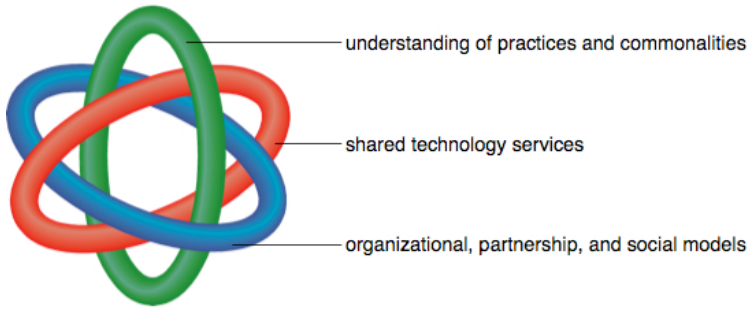
Bamboo strives to help the humanities flourish and evolve through the development of scholarly "cyberinfrastructure". At its core "cyberinfrastructure" and "e-scholarship" are

about three things: building common understandings at the intersection of disciplinary practice and digital technologies; deploying reliable, flexible, shared tools, content, and services open to many with growing economies of scale; sustaining these efforts through virtual organizations and laboratories that go beyond one campus and link together diverse institutional affiliations and cultures.

Loosely based on the "Borromean Ring" concept developed by Daniel Atkins, Office of Cyberinfrastructure within the National Science Foundation, the *Bamboo Vision for Cyberinfrastructure* applies the model of "three symmetric, interlocking rings" each which requires the other to function and adapts it to the arts and humanities. The model consists of three rings:

1. Bamboo as a forum for sharing digital research and teaching practices in the arts, humanities, and interpretive social sciences;
2. Bamboo as a facilitator and developer of shared technology services; and
3. Bamboo as a sustaining organization that promotes innovation and evolves over time.

Bamboo Vision of Cyberinfrastructure



Adapted from the "Borromean Ring Team" model for cyberinfrastructure
presented by D.H. Atkins, Office of Cyberinfrastructure, National Science Foundation

1.1.1 The Forum (Cyberinfrastructure Ring I)

The central ring of vision that focuses on the ongoing understanding of practices and commonalities across the arts, humanities, and interpretive social sciences is the Forum. Within the Forum there are several major components that include scholarly networking to bring individuals and groups together, scholarly narratives to share ways of working and approaches to problems across fields and domains, digital recipes that articulate specific flows of activity, guides for tools and content, and various user environments and interfaces to these and other resources from within and beyond the Bamboo Community. These components are articulated in detail within section 3.

The components are meant for everybody, from the humanities scholar who seeks guidance on how to take first steps in employing digital resources in his classroom to a graduate student trying to find collaborators in multiple disciplines, including the information sciences, so that she can trace the interpretations of historical figures in 19th century American urban settings by data mining all available newspapers and texts published from 1870-1890. The Forum is the virtual place to find, to share, to debate, to track others, to publish early ideas, to borrow, to build new collaborations, to learn together.

To quote Martin Mueller, Bamboo "plays the proverbial role of the onion in the stew or the role of a skillful host who introduces guests and then gets out the way of their conversation." Although elements of the Forum seem to stand alone, the fundamental principle of the Forum traces back to the foundational concept of Bamboo, shared technology services, and as such all components will be designed to "fit in" to other environments rather than "stand out" by forcing the community to use only one environment, tool, or capability. In other words, the components of the Forum can be shared, remixed, and reused to meet the needs of a specific project, community, or academic context. Although the Bamboo Community is the keeper of the Forum and its elements, any scholar within and outside of Bamboo can take advantage and seek the benefit of its services, capabilities, and components.

1.1.2 The Cloud (Cyberinfrastructure Ring II)

The second ring of the *Bamboo Vision for Cyberinfrastructure* is centered on shared technology services and in section 4, we define the constituent elements related to facilitating the use and development of shared services: the Services Atlas connects scholarly narratives, recipes and tools to componetized web services across disciplines; the Bamboo Exchange builds a light-weight market mechanism for exchanging resources and services across institutions; a shared service development lifecycle that takes services from project-level deployment, through incubation, and potentially in to Bamboo-wide deployment; tool and application alignment partnerships that enable core technology projects in the humanities to shape Bamboo and employ Bamboo's cloud-based services; and content interoperability partnerships that start from the premise that collections and corpora of digital content are the gravitational centers of much humanities scholarship and determine how services and tools can be better connected to these content sources.

The mixture of approaches (and metaphors) in section 4 - atlas, market exchange, local incubator, appliance, cloud, "refactoring" partnerships - reflects the challenge of finding a way forward to build sustainable infrastructure for scholarly computing across diverse institutions in a world made up of many actors, associations, interests, incentives, cultures, and technologies. Bamboo in no way proposes to coordinate or solve all technical needs, nor provide all shared technology services, for the humanities. This would be folly. Instead, we seek to create a set of realistic mechanisms to share technical expertise and to jump start deployment of sustainable infrastructure by borrowing from the best technical and organizational solutions available.

The core of our approach centers around the Bamboo Cloud. Some may scoff that the "cloud" is but the latest technology industry fad, highly complex vapor, and/or or of little relevance to most humanities scholars right now. These statements may in fact all be true. But they don't take away from the fact that for the longer-term (five to ten years) we must, in higher education, find ways to provide a cost-effective core and common set of increasingly rich, easy to use, sustainable technology services that are the foundation for scholarship. At this time the most promising approach to solve this challenge is to determine how universities and colleges can band together to define and deploy such services to the higher education community. This is the philosophy behind the Bamboo Cloud. Thus, as a short hand for the somewhat cumbersome and dry "shared technology services" or "sustainable infrastructure", we label this major section of the Bamboo program document, The Cloud.

1.1.3 Bamboo Labs (Cyberinfrastructure Ring III)

The final piece of the Bamboo cyberinfrastructure vision is built around the organizational, partnership, and social models behind both the technology and the scholarship. In section 5 of the program document, we set the scaffolding for Bamboo as a sustaining organization over time and across institutions: Bamboo learning from the evolving models of "community source" software development emerging from different technology consortia in and beyond academia; Bamboo situated in and supporting an ecosystem of projects and initiatives, and, in a number of cases, Bamboo stepping back and staying behind the scenes; Bamboo organized to explore, to plan, and to build; and Bamboo sustain and coordinate the efforts of the Bamboo Community and its members.

Amidst the consortial, financial, and administrative issues in section 5, we highlight an organizational ideal that many who took part in the Bamboo Planning Project workshops called out for, namely the think tank, "skunk works," and/or collaborative center. That is, a place to tinker, create, build with with a group of talented individuals, whether to explore the initial use of technology in humanities scholarship or connecting existing applications and services across several institutions. The model of labs is one that we believe is essential across many of Bamboo components, and one that we think a wide range of institutions may want to invest in, especially if we can bring together scholars and experts from across the humanities, information sciences, libraries and archives, university presses, learned societies, and information technology organizations.

A Lab may be housed at one institution (as a number already are) or may exist virtually across Bamboo to enable a number of institutions to explore, plan, and build one of Bamboo's core components. Although there are many dimensions related to Bamboo as a sustaining organization, what ties the community together are the opportunities to investigate and collaborate around ideas, projects, and activities and as such, we think of the sustaining organization as much more than administration: we envision it as a collection of labs around specific topics collectively known as Bamboo Labs.

1.2 Opportunities, Challenges and Benefits

> *I would like to propose a patron saint for cyberinfrastructure for the arts and humanities .... Benjamin Franklin. Why Ben, you might ask? It is partly that Franklin was a tinkerer with new technologies, a printer and a publisher, someone who established the first circulating library in the US, a politician with more than a dash of provocateur, and a pragmatist who figured out some important aspects of how to make revolution sustainable. Franklin was also famous for his maxims, and one of the best known of those he delivered was at the Continental Congress just before signing the Declaration of Independence. On that occasion, he said: We must, indeed, all hang together, or most assuredly, we shall hang separately. .... That's my short-hand definition of cyberinfrastructure, actually - the environment in which we all hang together, as opposed to the one in which we all hang separately.* — John Unsworth

One of the fundamental questions the Bamboo Community needs to be clear about as defines its first three-year implementation phase is what problems should Bamboo address and which communities will Bamboo benefit; and conversely, what problems and challenges should Bamboo stay away from. The Bamboo Program Document is the opportunity to think big, lay out the architecture of a long term program, engage in debate about where we should go, and define a strategy for investment over time.

A creeping vice of such an effort is to suffer from what Neil Fraistat has labeled as "Bamboo as the sublime" - that is, the urge to be all things to all people. We recognize that this is a recipe for failure. At the same time, institutions and organizations are determining whether to formally invest and join Bamboo, and need a sharp picture of what Bamboo will do, what the costs of participation will be, and what the benefits over time will be for different communities within their organizations. Because Bamboo envisioned to be about enabling possibilities, the table below lists a range of communities, problems and opportunities that Bamboo could explore in a 7-10 year period. Those institutions and organizations in the Bamboo Planning Process will use this as a framework to clarify Bamboo's long term vision and to narrow down the focus for Bamboo work in the first implementation phase.

This table starts with a community and a sample problem or opportunity (first column) and then points the reader to the parts of the Bamboo Program that can help to address these challenges (second column). This table represents a framework for thinking about what Bamboo can and cannot accomplish. As Bamboo matures, the means to address problems and opportunities will evolve, so what is outlined here is merely a starting point that will grow and change over time.

Community and Problem / Opportunity	**Bamboo Program Element that can Help Address these Challenges - These are Partial Examples**

Humanities Scholars: Faculty and Students	
The 5-10% of humanities scholars who lead technology projects and/or are software developers and who want to spend more time on research problems and less time developing and managing core technologies	See Services Atlas (4.1), Bamboo Exchange (4.2), Tool and Application Alignment Partnerships (4.4.)
The 90-95% of humanities scholars who want to learn more about digital scholarship and are not sure what is possible, where to turn, what to do	Scholarly Narratives (3.2), Scholarly Recipes (3.3), Tools and Content Guide (3.4)
Faculty and students who want to know what other people, projects, institutions are doing and saying in the humanities and "digital humanities"	Scholarly Networking (3.1), Scholarly Narratives (3.2.)
The graduate students who wants to easily blend together ("mash-up") content and visualizations from different archival sources to demonstrate a promising new area of study	Tools and Content Guide (3.4), Bamboo Cloud (4.3.3)
The Dean of the Arts and Humanities who wants to better support faculty and graduate student development by giving many individuals the opportunity to learn more about digital technologies and scholarly practices	All parts of the Bamboo Forum (3.1 - 3.5)
Humanities Centers and Other Centers for Collaborative Exploration	
The campus Humanities Center that is trying to determine what its "digital" presence should be, how best to engage scholars, and where resources will come from	Bamboo Forum (section 3)
The "Digital Humanities" Center that seeks to lead exploration and development of digital scholarship in one or several disciplines	Leadership role in Bamboo organizational model
Computer and Information Scientists	
Computer and Information Scientists who want to connect their research to the humanities	Bamboo Forum (section 3) and Shared Services Lifecycle (4.3)
Disciplinary Socieities	
Disciplinary societies that want to use "social networking" tools to foster scholarly communication	Scholarly Networking (3.1)

Disciplinary and scholarly societies who are seeking to develop new ways to measure and recognize scholarly publication	Data elements derived from Shared Services Lifecycle use (4.3)
Libraries, Archives, and Museums	
Librarians, Archives, Museums who want to open content to many scholars	Content and Interoperability Partnerships (4.5)
Librarians who want to connect new tools and services to campus libraries, archives, and museums	Content and Interoperability Partnerships (4.5)
The University Librarian who seeks to facilitate partnerships with local campus humanities and technology leaders and other institutions	Bamboo Labs and organizational model
Information Technology Organizations and Higher Education Technology Consortia	
Academic technologists who are struggling to find scaleable and sustainable ways to provide technology support to faculty and students from many disciplines	Bamboo Cloud (section 4)
The CIO who wants to ensure that institutional investments in technology are leveraged between disciplines and organizations	Bamboo Cloud and organizational model (sections 4 and 5)
The software developer who wants to share their tool / widget with the world of humanities scholars	Tools and Content Guide (3.4), Services Atlas (4.1), Bamboo Exchange (4.2)
The national, international, and disciplinary technology consortia that is seeking to re-architect its services platform to take advantage of services-based solutions	Tool and Application Alignment Partnerships (4.5)
Campus and other higher education technology leaders who are trying to determine how to develop and implement "cloud" based computing solutions and common frameworks	Bamboo Cloud (section 4)
Campus Chancellors and Provosts	
The Provost who wants to sustain excellence and innovation in the arts and humanities by leveraging technology investments and expertise across the sciences, social sciences, and humanities	Institutional investments and leadership in Bamboo Forum, Cloud, and/or Labs

2. Scope of Work

2.1. The Fundamental Question

Bamboo is different from most community development efforts in that it is not striving to create a single application nor a suite of software. Instead, the scope of Bamboo and the program of work is centered around creating cyberinfrastructure and with that, shared capacity within, across, and between institutions to better enable and foster innovation in the arts, humanities, and social sciences. Components, clouds, collaborations, and communities are all part of the scope of Bamboo.

Before detailing the scope of Bamboo for the decade between 2010 through 2020, it is important to understand three pieces of the fundamental question Bamboo continues to explore:

*How do **we advance** arts and humanities research through the development **of shared technology services**?*

First, "we" encompasses not just arts, humanities, and social sciences faculty, researchers and scholars, but also includes the myriad individuals and groups who directly or indirectly support or are engaged in research, teaching, and learning. So in essence, Bamboo includes scholars as well as (but not limited to) students, librarians, information technology professionals, computer and information scientists, content partners and providers, application developers and software engineers, publishers, content creators, archivists, human interaction and user interface specialists. The "we" also engages representatives from funding agencies, humanities centers, professional organizations, digital humanities centers, societies, museums, national and private libraries, cultural heritage organizations, arts organizations, government, and industry. The important part is that all participants in Bamboo believe that, despite inevitable differences, working together across disciplines, fields, institutions and other boundaries will ultimately enhance and advance research, teaching, and learning in the arts, humanities and interpretive social sciences. As long as the members of the Bamboo Community agree that the common good for all Bamboo participants is at the center of its efforts, Bamboo will succeed in its vision.

Second, "advance" refers to continually moving scholarship forward and in doing so, recognizes that innovation is essential to the long-term success of Bamboo. As a community working together, we must strive to not stifle individual innovation but seek ways to balance what's possible with what's desired. Some problems may not be solvable in the short term, but as long as Bamboo continues to contribute toward advancing research, learning, and teaching such ideas may come to fruition over time. To accomplish this, the community must be willing to adapt to changing technological, economic, and social models over the lifespan of Bamboo.

Third, during the life of Bamboo there will be different technological solutions to achieve the goal of sharing resources and capabilities across project, organizational and

institutional boundaries. The statement of "shared technology services" represents the concept of Web services and with that, an understanding that there are multiple approaches to provisioning and consuming services. These services shall be shared across institutional boundaries and capable of being used by various elements of the Bamboo Community while respecting the issues and realities associated with licensed content, specialized resources, etc.

"Shared technology services" implies much more than access as sharing itself assumes a level of trust that resources will be available when an individual or project needs them. Therefore, the shared approach assumes that with wider adoption, some services will transition from being research and into production. With that, services will need to be maintained over time and lead to the issue of service stewardship.

Bamboo should strive to "fit in" rather than "stand out" by adopting standards and practices common in higher education and industry as well as within disciplines and fields. What Bamboo adopts in terms of technologies, protocols, and services shall respect "we" and "advance" scholarship; only by doing that will services be shared.

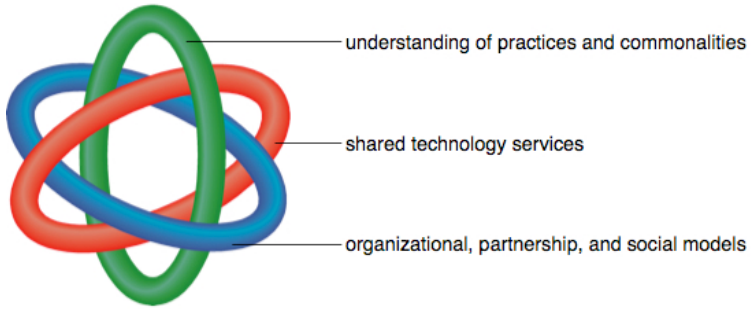
2.2. Scope

As stated earlier, the vision for Bamboo is rooted in sharing technology services across academic, professional, and organizational boundaries with a goal to better foster, grow, and sustain innovation in research, teaching, learning, practice and performance. To accomplish this, Bamboo strives to build shared capacity among institutions to create, reuse, remix, and recycle technology across research projects, learning experiences, and scholarly endeavors. For Bamboo, shared capacity means to amplify one's local resources that support research and teaching (time, staff, technology, finances, etc.) by leveraging the contributions of the community to reduce the need to recreate or reinvent technologies, processes, or approaches that have already been developed.

Fundamentally, Bamboo is a cyberinfrastructure (e-infrastructure) initiative for the arts and humanities. Cyberinfrastructure is widely understood to be much more than software capabilities and technology infrastructure, and as such, Bamboo is no exception. The initiative encompasses the social and support infrastructures as well as the standards and practices needed for the sharing of services, resources, and technologies across fields, disciplines, and organizations.

As highlighted in section 1, the *Bamboo Vision for Cyberinfrastructure* is loosely based on the "Borromean Ring Team" concept presented by D.H. Atkins, Office of Cyberinfrastructure, National Science Foundation:

Bamboo Vision of Cyberinfrastructure



Adapted from the "Borromean Ring Team" model for cyberinfrastructure
presented by D.H. Atkins, Office of Cyberinfrastructure, National Science Foundation

In summary, the Bamboo Borromean Ring model consists of three elements:

1. understanding of practices and commonalities: collect, discuss, and share scholarly practices in order to identify commonalities and evolve the direction of the initiative over time;
2. shared technology services: interoperable and composable software services from across the world that can be easily discovered, used, combined, and integrated into key research and teaching practices and projects; and
3. organizational, partnership, and social models: the human dimension where innovation can be supported within and between campuses and other key organizations.

These elements provide the groundwork for the scope of Bamboo and inform the program of activities. Based on this vision of cyberinfrastructure and the work of the Bamboo Planning Project, the scope of Bamboo includes:

- identifying and exposing shared technology services to promote inter-institutional and trans-disciplinary use of services in research, teaching, and learning;
- defining and developing lightweight infrastructure to discover, use, and remix shared technology services;
- discovering, promoting, and sharing service-aware tools and content sources;
- developing educational and professional development programs around creating and using shared services projects and/or tools in research, learning and teaching, which includes (but is not limited to) community awareness programs, curricula for undergraduate and graduate students, and workshops and colloquia for faculty, students and staff;

- collecting and analyzing scholarly narratives that express particular aspects of scholarship, scholarly workflow, research, and/or teaching that are or could be facilitated by technology;
- exploring, identifying and creating scholarly networking components that aid interactions within a discipline, trans-discipline, as part of scholarly societies, and in mediated/in person settings;
- identifying, collecting, and selecting common standards and practices; and
- communicating and marketing the strategic value of Bamboo to institutions and organizations.

This scope represents the work of Bamboo over a 10-year period beginning in 2010. By no means does this scope imply that all of these areas will be tackled at once or in a single development effort. The list represents the range of activity envisioned for Bamboo and elements shall be undertaken as interest, resources, and demand become available.

2.3. Program

This approach places new demands on people, processes, institutions, and organizations. Underlying Bamboo is an idea that by working together within and across our institutions, disciplines, organizations, and areas of expertise, we have the potential to do a better job of supporting humanities scholars and practitioners, whether students or faculty. Because Bamboo is much more than technology, the program includes three distinct areas of focus and leadership: Bamboo Explore, Bamboo Plan, and Bamboo Build.

2.3.1 Bamboo Explore

Bamboo Explore is responsible for developing, growing and nurturing the Bamboo Community. Explore observes and analyzes the community's adoption and use of both Bamboo and non-Bamboo services, tools, and programs and recommends ways in which Bamboo can evolve and adapt to changing needs. Explore:

- observes and reacts to community needs,
- connects activities, and
- contextualizes action and use.

Within this area is the entire Bamboo Community and its various groups and subgroups. Explore coordinates activity among Bamboo Community members, sponsors Bamboo programs and workshops, and promotes Bamboo adoption and use. It is within Explore one can envision cross-disciplinary networks, informal collaborations, and project-to-project resource sharing potentially organized formally as Explore Labs.

Aspects of education and professional development, communication and marketing, collecting and analyzing scholarly narratives, and identifying and creating components that enable scholarly networking exist within Explore. Ultimately, Bamboo Explore

investigates possibilities enabled or created by Bamboo and drives the evolution of Bamboo over time as it largely is the voice of the Bamboo Community.

The program within Explore is one based on community engagement and social networking.

2.3.2 Bamboo Plan

Bamboo Plan is responsible for planning infrastructure, formally expressing Bamboo standards, guidelines and practices, and liaising with other consortia, societies and organizations. Plan:

- acts on input from Explore,
- filters recommendations, and
- prioritizes action.

In terms of standards, Plan (and therefore, Bamboo) shall not define and create Bamboo-specific standards. Instead, Plan shall adopt existing standards and specifications, and where standards or specifications don't exist, liaise with appropriate organizations to encourage the development of such materials. Bamboo Plan may compile sets of standards and specifications in the form of a profile to better promote interoperability. Such activity does not indicate the creation and maintenance of a Bamboo-specific standard, but rather such should be viewed as an aggregation of other works on behalf of the community.

Formal relationships with professional societies and organizations are critical to the ongoing success of Bamboo. Therefore, Plan shall include a formal liaison function to promote inter-project collaboration and communication. Bamboo members may act as formal liaisons through Plan in order to better connect Bamboo and its efforts with fields, regions, and activities by leveraging established relationships. Although liaisons are formally recognized in Bamboo Plan, they can engage at any level within Bamboo and as part of any activity that seems appropriate.

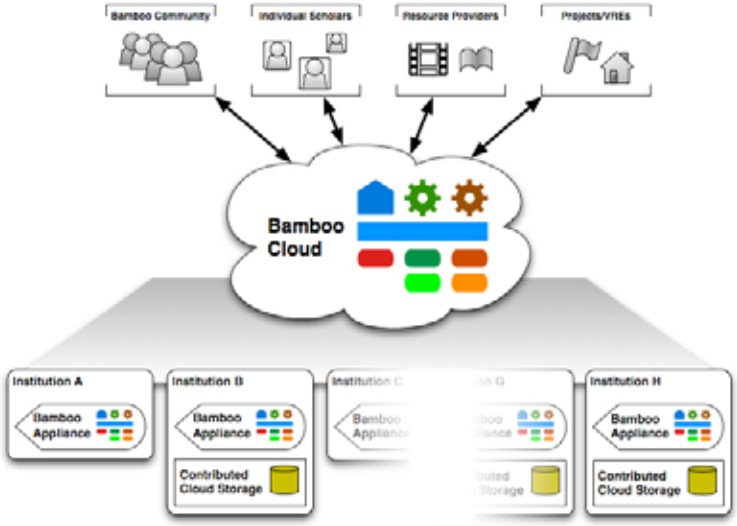
Within Plan are elements of identifying shared technology services, defining infrastructure, working with tool and content partners, and analyzing scholarly narratives with a specific aim of planning what needs to be accomplished for the good of the Bamboo Community. In essence, Plan is the architectural layer of Bamboo and as such, acts on recommendations from Explore and filters and prioritizes those recommendations to Bamboo Build. This activity shall occur within a range of Plan Labs.

Envisioned within Bamboo Plan are two overlapping and related areas each with specific activities to lead and coordinate: "Architecture & Services" and "Standards, Guidelines & Practices."

2.3.2.1 Architecture & Services

The program for the Architecture & Services area of Bamboo Plan is based on a model centered on strategic planning and community design. The primary aspects of the Architecture & Services area of Plan are:

1. Based on input from Bamboo Explore, review, prioritize and initiate development activities that directly benefit the Bamboo Community.
2. Maintain the architectural and technical vision and plan for Bamboo including the growth, expansion and evolution of the Bamboo Services Atlas.
3. Design, plan and architect the Bamboo Cloud (in general terms, see http://en.wikipedia.org/wiki/Cloud_computing). The cloud shall be distributed across a minimum of three partners in a virtualized and scalable manner, be capable of elastic expansion/contraction with the ability to dynamically add capacity within or across hosting locations as necessary, and provide continuous and reliable services to the community without having to select a specific provider for Bamboo Cloud services.



4. Design, plan and architect the Bamboo Service Registry within the Bamboo Cloud. The Bamboo Service Registry shall include both the capability of registering services of interest or provisioned to the community as well as tools, applications, and components that consume such services. The registry shall also include the contracts necessary for service interaction.
5. Design, plan and architect the Bamboo Recipe Registry within the Bamboo Cloud. The Bamboo Recipe Registry shall be provisioned through the Bamboo Cloud and provide the infrastructure and services for the collection, analysis and

dissemination of Bamboo Recipes and workflows. It shall provide services, which in turn, shall be registered in the Bamboo Service Registry.

6. Design, plan and architect the Bamboo Service Platform within the Bamboo Cloud. The Bamboo Service Platform shall be based on existing technologies, service provisioning platforms or service bus environments and provide the means to host and deliver services to the community. The Bamboo Service Platform shall be the manner in which individual project services that grow to greater utility to the community may be promoted and sustained over time. The initial set of services provisioned on the Bamboo Service Platform may include the services of the Bamboo Service Registry and the Bamboo Recipe Registry as well as candidate services from the Bamboo Community.
7. Design, plan and architect the Bamboo Services Atlas within the Bamboo Cloud.
8. Design, plan and architect the Bamboo Exchange.
9. In collaboration with Bamboo Explore, design, plan and architect a reference user experience (Bamboo Community Environment) for discovering and consuming Bamboo resources, tools, and services. The user interface shall, at a minimum, include plug-ins and/or widgets (one or several) that can be easily integrated into existing virtual research environments (VREs), portals, and/or social networking environments, and be based on open interface specifications such as Fluid.
10. Design, plan and architect a virtual research environment (VRE) within the Bamboo Cloud that will take the place of the current collaboration environment, wiki.projectbamboo.org. Bamboo VRE shall be the space where project collaboration, virtual community building and other activities in support of Bamboo takes place. It shall be built upon and integrate the technologies, standards, and capabilities promoted and adopted by the Bamboo Community and as such, act as a reference implementation for all of Bamboo plug-ins, widgets, and infrastructure. The Bamboo VRE shall be based on existing technologies, services, platforms, and environments wherever possible, and incorporate the Bamboo Community Environment as appropriate.
11. Based on input from Bamboo Explore and the community, identify, negotiate the use of, and incorporate services into the Bamboo Cloud and the Bamboo Service Platform that have either achieved widespread adoption or seem appropriate to provision in a more generalized manner.

2.3.2.2 Standards, Guidelines & Practices

The program for Standards, Guidelines & Practices within Bamboo Plan is based on standards adoption, maintenance and remediation.

1. Maintain the collection of standards, practices, and guidelines for Bamboo.
2. Based on input from Bamboo Explore, establish, review, select and publish profiles of standards and specifications that promote the sharing of content and services across the Bamboo Community.
3. Establish and maintain formal relationships with standards and specifications organizations.

4. Define, express and maintain the common specifications around the metadata associate with the Bamboo Service Registry including interoperability requirements for Common Services and their service contracts.
5. Define, express and maintain the characteristic and metadata specifications including the classes of resources, specifications for expressing and exchanging resources, etc.
6. Define, express and maintain characteristics and metadata of recipes including the descriptive and technical representation of workflows, and other related materials that are both technical for interoperability and informative for adoption.
7. Define, express and maintain the specifications and requirements for provisioning services.

2.3.3 Bamboo Build

Numerous models exist for sharing data and processes over a network, and a number of these models are commonplace within industry, content providers, libraries, and campus information technology organizations. Also, several of these models enable highly-specific needs to be met in rapid and reproducible ways at relatively low cost provided an appropriate infrastructure exists to support such work. The Bamboo notion of shared technology services blends the strengths of enterprise computing and content management with the flexibility of Web services and academic exploration. This blend when combined across institutions creates a shared capacity in the form of a common lightweight infrastructure of discoverable and sharable resources.

Let's imagine a faculty member at an institution who wants to develop a project that explores patterns in texts and has access to the resources of Bamboo. In this example, content from one organization can be explored and manipulated by a researcher at a different institution through a combination of services provided locally, by other Bamboo participants, and through commercial providers. The researcher focuses on the problem she is trying to solve by developing only what's necessary, and the local institution leverages Bamboo and its lightweight infrastructure to discover and reuse textual analysis services from elsewhere, thus reducing time and expense by not reinventing what has already been created. The Bamboo community shares the responsibility of providing resources to the individual project but at a low incremental cost. In the long term, institutions participating in Bamboo should see a minimal resource impact in that the incremental contribution to Bamboo would be merely an extension of the services already being provided to its own students and faculty.

Bamboo Build is responsible for adapting and creating the components deemed essential to the Bamboo Community, adopts or implements software components of Bamboo infrastructure and shared services, and manages the technology layer of Bamboo itself. These components, services and infrastructure shall be provided as a utility to the community and as such, be delivered in a manner analogous to a cloud model. The complexity of the Bamboo Cloud shall be placed at a layer of abstraction from the underlying technology and user experience to enable distribution, federation, scalability and replication of the infrastructure and services to occur without affecting use and

adoption by members of the community. Initially and more specifically, Bamboo Build shall establish the Bamboo Cloud and within that space, build and minimally maintain the services and capabilities defined by Bamboo Plan as well as the Bamboo Community Environment.

All of these elements shall be initiated, defined, specified, and designed by Bamboo Plan and as such, Bamboo Build shall not initiate development without input and guidance from Bamboo Plan. Maintenance of these elements shall be handled and coordinated by Bamboo Build; this includes minor revisions, bug fixes, etc. Major changes or revisions shall be referred to Bamboo Plan as a candidate project. Work shall be organized as formally established Build Labs.

The program within Build is one based on community-source software development.

MAJOR ACTIVITIES

3. THE FORUM

Bamboo as a Forum for sharing digital research and teaching practices in the arts, humanities, and interpretive social sciences is meant to develop and integrate the information resources and tools needed so that thousands of scholars, technologists, librarians, and others can easily find and connect with people, projects, tools, examples and exemplars, recipes, and other educational materials to enable an "upward spiral" of conversation and understanding about the digital humanities. The "Forum" is the place to find, to share, to debate, to track others, to publish early ideas, to borrow, to learn together.

The core components of the "Forum" - Scholarly Network, Scholarly Narratives, Recipes, Tools and Content Guide, Educational Materials, and the means for accessing these information sources through various Community Environments - interrelate and complement each other. We start with Scholarly Network because of the fundamental and growing importance of the means to build community and participate across multiple social networks and roles. Scholarly Narratives then offers an open avenue for scholars to express their needs and experiences in the language of their practice and discipline. These narratives are of value in themselves and serve, as well, as a pivot point for librarians and technologists, among others, to build "recipes" that abstract common steps and resources across stories to help build guides for the digital humanities. In addition, narratives and recipes serve as a critical body of materials to help software developers understand where investments in common services may be most beneficial (see the Services Atlas in section 4 on this connection). Scholarly Narratives and Recipes draw from and contribute to the Tools and Content Guide; for example, the guide provides the details about the scholarly content and tools that are the ingredients and implements in the recipes. The Tool and Content Guide becomes a place as well for developers to add

information about the evolution of applications and digital materials. Finally, there will be other forms of curricular resources and professional development materials that powerfully link these narratives, recipes, tools, and content into course and disciplinary specific guides. Each of these components of the "Forum" represents a different entry point and view, whether by story or by tool or by discipline, into the evolving community of the digital humanities.

We note in this section that Bamboo does not propose that each of these components be built as independent applications in themselves, but rather that we find ways to instantiate each component as a type of service and/or "gadget" with common technical interfaces so that they can be incorporated into, and help connect, existing web-based collaborative and personal information environments, portals, social networks, and the like. We propose as well that each component be enabled with rich forms of tagging and data-structure to enable powerful forms of data-mining and the ability to add all kinds of other views, reports, and data-exposure, some of which may, in the long term, serve as important sources of information to help faculty and learned societies develop new forms of tracking citation, authority, usage, and contribution to scholarly communication.

3.1. SCHOLARLY NETWORK

The virtual place for people to discover, explore, and connect with other people and groups across the Bamboo community. The Bamboo Scholarly Network may be implemented through interconnecting existing social networking tools, including the use of plug-ins and/or widgets based on open interface standards that will allow the Scholarly Network to be easily incorporated into existing portals, virtual research environments, or other research workflow systems and tools.

3.1.1 SCHOLARLY NETWORKING: DEFINITION AND APPROACH

The increase in scholars using social networking tools[1] to communicate with their peers was a major theme in the discussion of emerging practices at Workshop 1. Sustained interest in scholarly networking as an aspect of Project Bamboo led to the development of a working group to specifically address potential approaches to scholarly networking within the context of Bamboo. A definition of scholarly networking and a statement addressing its value is a necessary prerequisite to such work, particularly in view of the skepticism directed towards scholarly networking by some workshop participants. We note, as well, the emerging interest in scholarly networking by a number of learned societies in the humanities and the important opportunity to be guided by these societies in the development of Bamboo's approach to scholarly networking.

3.1.1.1 DEFINITION AND VALUE

[1] This will henceforth be referred to as "scholarly networking" - a term designed to differentiate scholars' professional-centric social networking / social media activities from those of a personal nature. This term is not without its critics, both due to the increased mixing of professional and personal communication and the perceived elitism of the term. "Social networking in education" is another suggested term. (Open University report on Scholarly Networking, p. 7)

The charter of the Project Bamboo scholarly networking working group defines its aim as "exploring the ways in which faculty and scholars interact within a discipline, trans-discipline, as part of scholarly societies, and in mediated/in person settings'." Scholarly networking refers to the subsection of those interactions mediated by web 2.0 technologies that can also be used in a purely social context. This differentiates scholarly networking from more traditional forms of on-line communication between scholars, such as mailing lists, which are more likely to be "strictly business".

Scholarly networking using social networking platforms like Facebook provides a way for scholars-- even those with obscure interests-- to connect with others who share those interests and initiate a "permanent corridor conversation"[2] regardless of where their peers are located. While this was not commonly cited at the workshops, scholarly networking could conceivably provide a way for librarians, IT staff, and commercial sector personnel to connect for collaboration purposes. Facebook is also used as a way to put a human face on organizations such as the library reference desk that might otherwise be perceived as impersonal. Blogging is already being used as a way for scholars to solicit feedback from their peers about work in progress, though workshop participants noted the IP risks associated with such an activity. Twitter and other "micro-blogging" platforms are used as a way to ask and receive answers to brief questions.

The ability to connect other scholars' comments with personal profiles on a scholarly network facilitates building confidence in others before potential collaboration, allowing scholars to see each other in a more human light than conveyed by a list of qualifications on a curriculum vitae (CV).

From a teaching perspective, the ability for students to connect with one another outside of class can build cohesion, particularly in distance learning situations. At the graduate level, scholarly networking can provide a new managerial tool for scholars chairing dissertation committees, providing an informal way to check in with ABD (All But Dissertation) students who are writing their dissertations off campus. A message sent through a social networking platform invokes the informal tone an advisor might have his advisee upon running into them on campus, in contrast with the more official undertone of e-mail.[3]

3.1.1.2 Approach

Noteworthy in both workshop participants' comments and an Open University report on Scholarly Networking is the fact that scholars are likely to use the same account for scholarly and social networking activities. In its approach to scholarly networking, Project Bamboo aims to bring additional "scholarly" features and resources to scholars where they already are, as opposed to building a "Bamboo Scholarly Networking Platform" from scratch and asking scholars to join and monitor something separate from

[2] Open University report on Scholarly Networking, p. 1

[3] The Open University report has a more extensive list of purposes for scholarly networking, p. 16.

what they are already doing. This will take the form of plug-ins or widgets compatible with any platform that uses a supported set of open APIs (Application Programming Interfaces).

As well as widget add-ins to existing, fully-formed sites, we intend to initiate a dialogue with the developers of nascent VRE (Virtual Research Environment) / scholarly networking platforms (including Sakai, Thought Ark, and Heurist) about the possibility of natively integrating the capabilities that would otherwise be provided through a widget.

3.1.2 Widgets

The widgets supporting scholarly networking will derive from two sources, and will be developed in two stages.

3.1.2.1 Core Bamboo widgets

This set of widgets will be an early focus of Bamboo development, providing a front end for other aspects of Bamboo including the Bamboo Exchange. The goal of these widgets is to enable a user to access Bamboo resources (tools, content, people) from within their preferred scholarly networking environment. Conceivably, a scholar could search for and reference a tool in the Bamboo marketplace from within their blog, or "like"[4] a content source from within Facebook, which would bring that content source to the attention of the scholar's contacts. The goal of these widgets is to provide a means of integrating Bamboo resources into scholars' existing networking activities, though they do not preclude the additional development of a website providing a stand-alone portal into the same resources.

3.1.2.2 Supplementary widgets

The core Bamboo widgets will serve as a "reference implementation" for the development of other resources for scholars with a widget interface. We anticipate that Common Services, as well as Local and Incubator services on a path to become Common Services, will develop a widget version where appropriate. To facilitate this development, we will provide a series of specs that clearly state the requirements for developing widgets for each of the most common platforms for scholars. This will enable developers to make informed decisions about compatibility; in some cases, it may be appropriate to develop with only VREs in mind, even if it means excluding social platforms like Facebook.

3.1.3 The widget model in a cloud environment

Enabling widgets are intrinsically linked to some form of cloud environment. While widgets may be plugged into a campus-internal system such as a VRE, the Bamboo

[4] A non-textual statement of approval broadcasted to one's colleagues.

Exchange data that the core Bamboo widgets connect to is stored in the cloud. Supplementary widgets, in contrast, may be entirely self-contained.

3.2. Scholarly Narratives

A growing body of scholars' stories about the use of digital technologies across the arts, humanities, and interpretive social sciences. These narratives serve as one critical entry point for learning what can be done and for rapidly sharing updates on work in progress. This Scholarly Narratives hub will interconnect with digital Recipes, Tools Guide, Educational Materials, and Services Atlas described below.

3.2.1 Definition

A scholarly narrative is an articulation of a scholar's personal research or teaching practices, methodologies, or work efforts. It need not be comprehensive of everything a scholar does, but should be very concrete about the portion it is describing. It should be written in the scholar's own words and be understandable by other colleagues in her field. Finally, it should be bounded by some kind of beginning task and ending task. How to demarcate this boundary is more of an art than a science, but it is meant to place a logical boundary around a set of work to best enable further analysis.

To fully document a scholarly narrative and allow for full-circle discussion with the scholarly contributor, various pieces of metadata must also be collected. Contributor metadata includes name, title institution, contact information, and field of study and /or creative endeavor; collector metadata includes name, title, institution, and contact information.

3.2.2 Role

Scholarly narratives are not an end in themselves; they are understandable entry point for scholars to enter into the world of the digital humanities. The text of a narrative should reflect scholarly language and methodologies that other scholars would understand. A direct link between generalized practices in Recipes (cf. 3.3, below) and self-described practices (Narratives) provides a discussion forum within which scholars can facilitate the accurate description of their efforts and clarify their needs. It allows for significant feedback as to whether their practice was interpreted correctly, opportunity to better shape this interpretation, and when the interpretation fully captures the self-described narrative, it can lead to deeper levels of analysis upon which services can be derived.

3.3. Recipes (Workflows)

Scholarly Narratives are stories scholars shared about what they wanted to do with technology in their research and teaching, and Recipes draw on the narratives to propose general tasks that scholars want to accomplish with information technology. The Recipes draw on examples and describe a generalized way (a workflow) of doing something important to a scholar. Recipes are assembled and described by a community of

scholarship that includes faculty, librarians, and/or technology support-staff who both use the technology and support research, teaching, learning, and scholarship. In essence, Recipes are distillation of the Bamboo Community's ideas around how to best accomplish real academic tasks.

3.3.1 Definition

A recipe is a selected list of resources or resource types which can be combined to solve a problem or explore a question. These resources might include tools, services, repositories, and people. A recipe is action-oriented -- it expresses a method for moving in a particular direction and toward a particular goal. However, a recipe is not necessarily an end unto itself -- it might instead be only one component of a larger inquiry. Recipes will follow a standardized format when possible. Clarity and concision are essential.

Recipes are a structured response to the community of scholars in the humanities. We chose to call them recipes because we all know how a recipe works for getting something done like cooking a dish using utensils. Therefore our recipes typically describe:

- **Introduction** What this recipe is for cooking up, typically a general task
- **Ingredients** What do you need to be able to follow the process, the types of tools and content you need at hand
- **Steps** What are the steps or activities in the process, how to get something done with the ingredients

Each ingredient can then be linked to more detailed descriptions. The collaborative services ecosystem envisioned by Bamboo can be activated by interaction with these recipes -- a scholar could take immediate action based on a recipe, and directly connected with a guide to the relevant resources they are eligible for -- based on their local campus, their institution's consortial agreements, offerings in the Bamboo community cloud, and public and commercial providers.

3.3.2 Role in Research Projects

A successful recipe must be sufficiently contextualized to be recognizable, relevant, and useful to multiple scholars who are either working in related areas of study (e.g. 17th century Chinese history, outsider art in India, oral traditions in Hawaii) or on methodologically related problems (e.g. textual analysis, video annotation, technology-enabled performance art). A recipe must also be specific enough to be helpful to non-scholars, including technical staff, librarians, etc. who are supporting a scholar in her inquiry. Recipes express a problem-solving strategy in a format which can help bridge gaps between different types of Bamboo community members.

Recipes draw on the Scholarly Narratives to propose general tasks that scholars want to do with information technology. The Scholarly Narratives are the stories scholars told about what they wanted to do with technology in their research and teaching. The Recipes draw on these and describe a generalized way (a workflow) of doing something

important to a scholar. These Recipes are put together by the community of scholars who use technology. They are the Bamboo Community's ideas about how to best get real academic tasks done. Recipes will be recorded in and accessible from the Bamboo Recipe Registry.

Recipes introduce an important level of sustainability and scalability into the arts and humanities research ecosystem. Although no textual representation can replace the value of a live conversation among scholars, librarians, and technology consultants who are skilled in mutual translation, such conversations are necessarily bounded in their influence. Recipes seek to make available to new projects the decisions, processes, and hard-won lessons of the thousands of endeavors which came before them.

3.3.3 Role Within Bamboo

Bamboo Recipes are a way of describing what a scholar can do with Bamboo at a given time. Scholars can use this to understand what Bamboo can do for them. Recipes are a way of prioritizing what should be developed. As Scholarly Narratives are added and Recipes drawn from them, decisions about technology to be implemented can take the form of prioritizing the Recipes. This avoids the problem of implementing technologies that only partly solve a real problem. Recipes are part of the evolution of Bamboo. Bamboo will evolve as scholars tell new stories about what they do, or want to do. As the Bamboo Community works together to analyze these new narratives and turn them into Recipes, we will build on the range of Activities we can support and imagine the new Activities we need to support. Recipes are a way of auditing what Bamboo does. One mechanism to verify that Bamboo is fulfilling its promise to scholars is to try following a recipe. A Recipe will readily expose what is working and what isn't.

Recipes can be adapted to a given situation. Recipes will be released in a structured fashion and under an open and flexible license for community use so that a scholar can adapt them to his own community and the tools he has at hand. Research support staff for a project or university can take the Recipes their community needs and adapt them to the tools they can support. The community can expand on the Recipes, translate them, add new ones specific to their needs, and link to content they have.

For Bamboo the recipe fills a critical role in linking narratives to technology. Within a narrative will be processes for research, composition, review, communication, creation and publication within the scholar's field. Bamboo seeks to abstract these elements as recipes such that the commonalities and differences between scholars, fields and processes can be understood. Understanding these common processes and the sensitivity to individual differences between scholars, organizations and fields provides analysts leverage in identifying services which can best support scholarship. Recipes are stored in a separate repository as derivative artifacts linked back to the narratives in which they were identified.

The Bamboo Community process for analyzing scholarship can be seen to form a chain from the descriptions of scholarship to the definition of technologies. This articulation

identifies the relationship between the world of the scholar and the world of the technologist and helps members of the Bamboo Community understand how their contribution advances our work. Further, as a portfolio of services is defined, we are able to show our supporters the linkage of those services back to the work of real scholars in our community.

3.3.4 Sustaining the Process

This approach carries with it some implication of ongoing effort by the community to promote use, curate submissions, and sustain overall momentum. Sharing a new narrative or deriving a new recipe will require deep thought from community members, and the use of these thoughtful contributions will be tracked and recognized. The technology to support the collection of these materials must allow the scholar to make their contribution without a hierarchy of complex steps. Contributing to the shared knowledge of the community in this way will be incentivized as more than a goodwill gesture, however. Bamboo will use textual analysis tools against the community contributed Narratives and Recipes to make connections between these contributions and suggest new possibilities. Simply by sharing with the community, a contributor will immediately and automatically gain further insight into their methods, domains, and questions.

3.4. Tools and Content Guide

The guide allows one to both publish information about, and to discover, tools and content sources that are of value for research and teaching. Scholarly Narratives and Recipes will draw from and point to this "ingredient list" -- a community-annotated list of tools and content resources. This registry becomes another "view," like that of the Scholarly Network, Narratives, and Recipes, into 'what is possible and what materials are available to help. Bamboo will employ mechanisms inspired by social media and Web 2.0 to make this process as frictionless as possible for the community.

3.5. Other Educational and Curricular Materials

A place for the dissemination and discussion of other related educational and curricular materials that can help students, faculty, library and technology professionals, and others to best integrate developing digital content and tools into researching, teaching, and public service.

3.6. Bamboo Community Environment

The environment where Scholarly Network, Narratives, Recipes, Tools/Content Guide, Educational Materials can be found. The environment may take two general forms: as a user interface that Bamboo develops and is run for the community and/or by developing each of these elements as information widgets/gadgets that can be incorporated into existing Virtual Research and Collaborative Environments.

The Bamboo Community Environment is the avenue by which a broad range of Bamboo elements are accessed. The elements accessed by the Bamboo Community Environment include the Scholarly Network, Scholarly Narratives, Recipes, Tools and Content Guide, and Educational & Curricular Materials described in this section of the Program Document; as well as the Service Atlas and Bamboo Exchange described in Section 4.

The Bamboo Community Environment is not a single user interface. It is envisioned as multiple "windows" onto the core elements that constitute Bamboo. It may take two general forms:

1. one or more user interfaces that Bamboo develops and is/are run for the community, accessible through a web browser; and/or
2. a set of information widgets/gadgets/services that can be incorporated into existing Virtual Research and Collaborative Environments

The core elements of Bamboo are thus made accessible from web browsers, Virtual Research Environments, Collaborative Environments, or any other application or platform into which Bamboo Community Environment widgets, gadgets, and/or services can be integrated.

3. The Cloud

The core of our approach centers around services and a cloud model of delivery. By using this admittedly nebulous and sometimes confusing term, we're introducing more than simply an approach to sharing services, gadgets or resources; we're expressing an infrastructure direction that minimizes risk to any one institution, is inherently redundant, has the potential to be of low cost to maintain, and introduces the potential for broad adoption across institutions, organizations and geographical boundaries in a sustainable and reliable manner. Although at a technical level, most of the pieces in this section can exist outside of a cloud approach, it is in tying them together for the common good of the Bamboo Community and the arts and humanities as a whole where collective value is gained. Therefore, we've opted to cluster all of these elements together within the notion of The Cloud.

While the term 'service' may be used to describe a broad or general operational capability (e.g., a social bookmarking service, an interlibrary loan service, an e-mail service, an academic computing support service, or other forms of technical expertise), the term is used in a narrower sense in this section of the Bamboo Program Document. Services, in the sense intended here, are relatively small units of software that deliver a set of capabilities grouped to most flexibly facilitate (a) interoperability with other software and/or digital content; and/or (b) combination and recombination with other services in support of multiple tasks or workflows.

Services are usually "under the hood" components of digital tools or applications with which a person engages directly. Tools and applications are relatively larger aggregations of software, and may be composed partly or wholly of services. A familiar example

might be Google's mapping service, which is accessed by programmers and web page designers using the Google Maps API (Application Programming Interface). Those who use Google mapping services to find their way to a restaurant or an archaeological excavation or a conference on 18th century French literature might use a web browser (a tool) to view a web page (a digital resource created for display using the tool) that calls on the Google Maps API to display the portion of the page that is a map; the service API exists at some remove from the user's perspective (i.e., "under the hood"). Similarly, the services described in this section may be closely related to or integrated with tools, but are not end-user oriented tools themselves. This document's Section 3.4, "Tools and Content Guide" further describes Bamboo's relationship to digital tools and content sources that are closer to the practice of scholarship than "services" in the sense intended here.

This Shared Technology Services section of the Bamboo Program Document begins with two sub-sections that address the "under the hood" character of services.

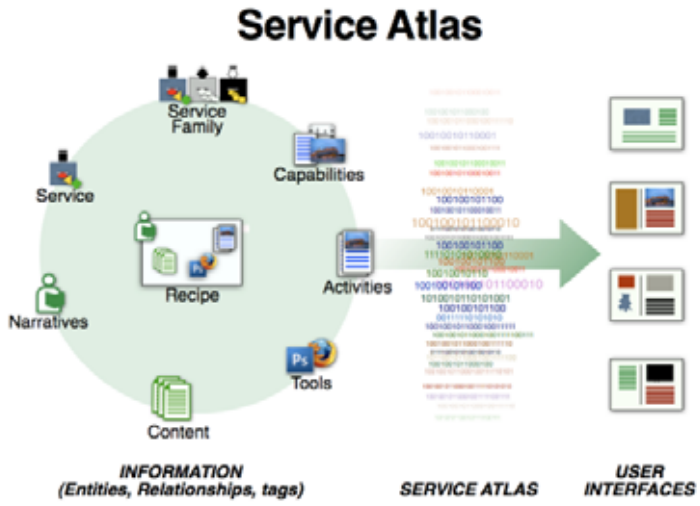
First, the Services Atlas will be a mechanism to link these "under the hood" elements to things that are more familiar to those who seek technology that benefits scholarship. Faculty and librarians in the arts and humanities disciplines, with the exception of those who have particular interests in the nuts-and-bolts of technology, are generally less concerned with "services" per se, and more concerned with tools and digital content; with the way tools and content can be applied to the constituent steps or activities of scholarship; and with the larger concepts, issues, and goals of scholarship. The Services Atlas is intended to serve as a bridge between levels of detail and perspectives native to Bamboo's multiple communities, so that scholars who wish to explore the technologies they use or contemplate using can trace from descriptions and artifacts that are familiar, all the way into the detailed models and specifications that are usually of most interest to technologists. Similarly, the Services Atlas will offer a means for technologists (and their funders and managers) to trace the software artifacts they build (or fund or manage) to the broad or specific ways that technology is adding value to scholarship.

Second, the Bamboo Exchange will provide a means for those engaged in scholarship to make connections that will help them to advance their work using services. The Bamboo Exchange will enable scholars to find tools and digital methodologies of value and interest to them, and expertise to help them build or use services that can enable or enhance those tools and methodologies to better fit scholarly need.

The latter sub-sections of the Shared Technology Services section of the Program Document address some of the logistical aspects of identifying, refining, and making services available for use (Services Lifecyle), and partnering with extant tools projects, digital archives, and others to broaden the field of easily interoperable digital aids to arts, humanities, and interpretive social sciences scholarship (Tool and Application Alignment Partnerships and Content Interoperability Partnerships).

4.1. Services Atlas

The Services Atlas records and delivers community input (Scholarly Narratives, Recipes, Activities, Tool examples, Content/Resource examples, Service Families, Service Candidates, Service Contracts, and extant Services - including community-contributed references to information outside the formal bounds of Bamboo) in easily updated, linked, annotatable forms that may be mixed, matched, categorized, and re-categorized in order to render the community's understanding of scholarly practice accessible from the multiple perspectives of diverse stakeholders native to Bamboo. Dynamic ability to incorporate and view evolving input and analysis, and quickly and clearly draw connections to broader context, will benefit faculty, librarians, funders, institutional leaders, technical architects, and service developers. These varied views of a changing landscape will enable informed governance by key stakeholders in arts, humanities, and interpretive social sciences scholarship. The services atlas is not a user interface, web page, or application; it is exposed as a set of services that may be presented in a tool, page, portal, or interface of one's choice, including but not limited to the Bamboo Exchange.



A Service Atlas is, for Bamboo's purposes, a gateway to a collection of information - some general some detailed - that in its expression and linkages permits individuals with different interests, skills, experience, and perspectives to understand the nature and utility of services, their purpose and relevance, the tools that incorporate them, and the body of work they are meant to support. A Service Atlas is intended to help faculty, librarians, funders, institutional leaders, technical architects, and service developers to navigate a large collection of information at the level of detail that will most effectively illuminate

understanding from the viewer's or user's perspective. The services atlas is not a user interface, web page, or application; it is exposed as a set of services that provide access to information that may be presented in a tool, page, portal, or interface of one's choice, including but not limited to the Bamboo Exchange.

The Bamboo Services Atlas will fulfill a number of purposes:

1. **Identify Existing Services**: Provide a mechanism for characterizing and discovering extant services that support scholarly practice (such a mechanism is often called a "services registry"). Characterization may include expert review from one or more perspectives (including scholars' assessment of value to/impact on scholarship; durability, from a curatorial point of view; and/or technically-relevant metrics).
2. **Connect Technology Services to Scholarly Practice**: Provide mechanisms to record and retrieve relationships between scholars' description of their work and services, tools, & content that support that practice.
3. **Enable Categorizations**: Enable application to Atlas content of tags, keywords, and/or categories, whether contributed by users or generated by data-mining software; and, by providing access to data elements, their metadata, and their relationships, enable representation of Atlas content in the context of these contributed or generated ontologies, taxonomies, and/or folksonomies. *Different representations thus enabled might be suited to a scholar's exploration of elements of interest (narratives, recipes, tools), to strategic planning tasks such as prioritization and application for funding (focusing on service families and the scholarship they advance), or to technologists' work such as modeling, designing, and implementing services (focusing on service modeling, design, and contracts).*
4. **Translate Across Communities**: Provide a means for Bamboo's multiple communities to nurture trust and understanding by identifying each others' activities and concerns from multiple points of view, and to assure that technology investments support scholarly need both as currently conducted and into an evolving future.
5. **Surface Elements of Scholarly Practice that can be enhanced or advanced by technology services**: By exposing its content for representation, the Atlas, to the extent it is populated, will describe areas of scholarly practice in the Arts, Humanities, and Interpretive Social Sciences that are suited to automation (i.e., suited to enhancement or support via shared technology services, including services whose function is to provide access to hardware-bound capabilities such as storage or telepresence).
6. **Surface Unsupported Scholarly Practice**: Provide a vehicle for identifying extant, anticipated, and/or intended practice of scholarship for which automating services and tools do not exist or are not known to Bamboo. *Creating support for new and intended practice may have transformative effects, whose value must be judged and whose nature must be governed by communities of scholarship.*

In order to fulfill these purposes, the Bamboo Services Atlas will incorporate artifacts that describe both activities and objects involved in scholarship ('verbs and nouns,' or

'steps and ingredients' - cf. Scholarly Narratives & Recipes); and support multiple points-of-entry to its content to facilitate understanding from multiple perspectives. Information will be exposed at multiple levels of detail (or 'granularity'), and be filterable via annotation, search, and discovery mechanisms designed to open access to audiences with different points of view. Though the Services Atlas is conceived as a (set of) 'back-end' service(s) - that is, the Atlas itself will have an API (Application Programming Interface), not a user-interface - it will support recording of and access to the characteristics of Atlas elements that are of interest to diverse communities of its users. (Bamboo will implement at least one user-interface to the Services Atlas; cf. Bamboo Exchange, below.)

The Bamboo Service Atlas will be composed from:

- Community contributions such as the Scholarly Narratives, Recipes, Activities, Tool examples, and Content/Resource examples being collected and recorded during the Bamboo Planning Phase on the project's wiki, including community-contributed references to information outside the formal bounds of Bamboo;
- Functionality of extant software (of most any origin) as analyzed and 'factored' into capabilities and services; and,
- Functionality of software 'in the pipeline' (i.e., software in some stage of planning, design, or development - within or beyond Bamboo community borders - but not yet in release or use) as analyzed and 'factored' into capabilities and services.

The Bamboo Services Atlas will consume and expose identifying and characterizing information about services from the Bamboo Service Registry, which will provide services to register and discover services, to record and obtain service contracts, and to record and discover information about service usage (consumption).

The Bamboo Services Atlas and Bamboo Exchange, once implemented, are expected to offer much simpler and more fully facilitated input, update, and hyperlinking capability than offered by the Bamboo Planning Wiki. The goal will be to provide access to Atlas content in accessible formats that are easily updated, hyperlinked, and annotatable. The Atlas and its Bamboo-provided user interface will support means to organize, mix, match, categorize, and re-categorize its constituent elements in order to render the community's understanding of scholarly practice accessible from the multiple perspectives of diverse stakeholders native to Bamboo. Dynamic ability to incorporate and view evolving input and analysis, and quickly and clearly draw connections to broader context, will enable informed governance by key stakeholders in arts, humanities, and interpretive social sciences scholarship.

Evolution of the Bamboo Service Atlas will occur gradually and iteratively. The collection and recording of information that is occurring in 2008-2009 on the Planning Wiki should be regarded as building an initial body of information to populate the Atlas, and evolving its information architecture. Atlas elements and functionality are expected to be made available through services that may be composed and rendered in a variety of end-user views and tools, such as web browsers, faceted browsers, and scholarly-networking platforms, in addition to the Bamboo Exchange. The Services Atlas is not

intended to catalog the totality of knowledge about scholarly practice, digital tools, or shared technology services; it will be useful to the extent it is well-populated with information by responsible and thoughtful contributors.

4.2. Bamboo Exchange

The Bamboo Exchange will serve as a focal point for information about services, tools, and content, including but not limited to services incorporated in the Service Atlas; and as a venue for resource exchange between marketplace participants. Incentives to participate in this marketplace will include a community-driven award system (including monetary rewards), expanded metrics about the way services are used by scholars and campuses, publicity, channels of communication to and feedback from the community of institutions and disciplines participating in Bamboo, as well as an avenue for access to Bamboo's experimental "incubator" service-deployment platform (cf.Local and Incubator Services, below).

The Exchange will allow scholars to discover new resources for their activities, explore and compare the relative capabilities of these resources, and to initiate exchanges of resources. The Exchange will feed information into, and receive information from, the Scholarly Network, to allow scholars to make informed choices among the resources offered via the exchange. The Exchange will allow resource providers to publicize and track the use of their resources, including the ability for experts (including librarians, programmers, consultants, and architects) to join and be compensated for project work housed at other institutions. The Exchange is inspired by several models in use elsewhere - Common Solutions Group, the United Way, ARTFL, and a range of online communities which track reputation and participation.

The Bamboo Exchange is a service to the entire community of Bamboo, and will be composed of a group of services developed or adapted, then deployed by, Bamboo Partners (cf. Common Services, below); and made available to the community in the form of plug-ins and/or widgets. The Exchange will be based on open interface standards that allow it to be easily incorporated into and presented/used within existing portal, virtual research environments, or other aggregation and/or research workflow systems and tools.

4.2.1 Enabling Discovery

The Bamboo Exchange will seek to aggregate and disseminate information about available services, tools, and content relevant to scholarship in arts, humanities, and interpretive social sciences, from a broad range of providers, but will also acknowledge that no single catalog can describe this space comprehensively. Because technology applicable to scholarship has been and will continue to be developed for scholars, projects, disciplines, institutions, et al., outside the auspices of Bamboo, mechanisms will be implemented to automatically harvest public information from builders and providers, as well as from other catalogs, in order to make their work and offerings discoverable from within the Bamboo Exchange; as well as mechanisms that allow service

builders/providers to actively and explicitly register information in the Bamboo Exchange.

Bamboo Exchange mechanisms for discovery of available services, including but not limited to those incorporated in the Services Atlas, will help scholars identify whether their need is already addressed before they put out a "bid" to technologists who might be interested in filling or helping to fill a gap. These mechanisms will also help technologists identify services that they might compose into new, enhanced service offerings. An exchange system (perhaps based on RFPs - Requests for Proposals - or other auction mechanisms) will enable people who need services developed to identify them, and people who want to build or provide services to share or sell them.

4.2.2 Exploration and Comparison

The Bamboo Exchange will allow for the browsing of resources, each expressed in a consistent manner to support comparison and transparency. One useful analogy which has been suggested here is the nutrition label -- a standardized view of the contents and capabilities of a resource, to allow for evaluation of the suitability, interoperability, and sustainability it offers for a given purpose and context. The Bamboo Exchange will track usage of developed services, and provide for collection of feedback; these data will be modeled, collected, and presented in ways that are meaningful to scholars and to technologists. In addition, all of this information will be exposed via an API - Application Programming Interface - so that other services and projects can incorporate and extend the capabilities of the Exchange. There may be minimum constraints for participation in the Bamboo Exchange, such as open source software licensing. Another key question will be whether and how any notion of "membership" in a Bamboo, higher education, or other community may in some situations change or restrict the availability of a given resource.

4.2.3 Initiating Exchanges of Resources

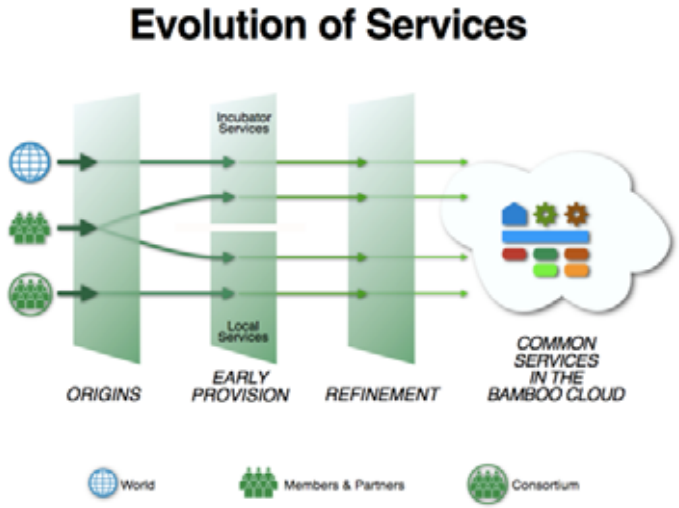
Several of the planning workshops surfaced a similar idea: what about a 'craigslist' (online classified ad system) for scholars? How can a faculty member at one institution connect with a digital humanist at another institution, simply in order to be pointed in the right direction for a technology solution and avoid reinventing the wheel? How can highly skilled research assistants be supported during gaps between grants? Through both free-form postings and an RFP forum, the Exchange will allow institutions to contract with other institutions for the use of resources. These resources might be technology, but one particular area of value is the ability to contract human resources through the exchange. This enables a scholar to gain access to expertise at other institutions for purposes of collaboration, wayfinding, and project work. For example, a scholar at the University of Puget Sound who needs access to an XSLT (Extensible Stylesheet Language Transformations) expert at the University of Chicago would be able to contract for a few hours of her time. The Exchange will support the exploration of multiple models for easing the transactional barriers between the resource pools at different institutions.

4.2.4 Rewarding Open and Interoperable Resource Creation

We will encourage and incentivize the community to build services more likely to become Bamboo "Common Services" -- i.e. those that adhere to community-determined development guidelines and standards for data/content interoperability. Some incentives include the opportunity to participate in a "Bamboo Incubator" (cf. Local and Incubator Services, below), and a community funding redistribution model which provides resources to selected community projects. An appropriate algorithm and strategy for funding redistribution will be determined by the community.

4.3. Shared Services Lifecycle

Sub-section 4.3.1, "Local and Incubator Services," describes early phases of discovery, adoption, or development of services of interest to the Bamboo Community. Sub-section 4.3.2, "Common Services," describes a phase of service refinement that addresses concerns like sustainability, standards-compliance, and reliability. Sub-section 4.3.3, "Bamboo Service-Delivery Appliances and the Bamboo Cloud," describes how Bamboo intends to make services available for use.



4.3.1 Local and Incubator Services

Working services that are not yet refined and offered as "common" may be provided from local or regional deployments by Bamboo institutions, and listed with appropriate

descriptors of service quality in the Bamboo Exchange. A deploying institution or group of institutions would be wholly responsible for availability and maintenance of such services; Bamboo as a consortium would make no guarantee regarding these limited or experimental deployments. Services deployed in Local and Incubator contexts are considered to be potential candidates for refinement, standardization, and adoption as "Common Services." Services deployed in these contexts may originate in the work of Bamboo member-institutions, or in the broader universe of service builders; it is the latter case that comprises Bamboo Incubator Service deployments, which will generally be segregated into a separate and parallel deployment context from services that originate in the development efforts of Bamboo members. The "incubator" concept is borrowed from W3C and Apache.

Bamboo Members involved in Explore and Plan layers of activity may identify services and service-providers evolving independently of Bamboo that are of 'preliminary interest'; and may invite deployment in a 'pre-consortial' context that offers exposure to the provider/builder and opportunity for exploration to Bamboo's community of scholarship. Local and Incubator deployments are avenues by which services may be identified - through exposure, experimentation, and observation of scholarly usage - for possible selection as candidates for refinement, standardization, and adoption as "Common Services." At least initially, no cost-recovery model is assumed to be available in the provision of services deployed in Local and Incubator contexts. Therefore, it is reasonable and expected that limits will be imposed on the quantity of resources that may be consumed as these services are utilized. Such limits will be an explicit element of Service Level Agreements (SLAs) associated with these service deployments.

These 'pre-consortial' deployment avenues recognize that a world of tool and service development has occurred, is occurring, and will continue outside the formal auspices of Project Bamboo, and that innovative development and use of software is likely to occur at the edges and beyond the borders of Bamboo's processes for aligning characteristics, standards-compliance, and deployment requirements of software services. Bamboo will therefore make explicit provision for its partners to offer, from within a Bamboo context, services for scholarship at levels of availability and refinement that fall outside a definition of "Common Services" (see below).

Services such as these, that are not "Common Services," but are served (hosted/deployed) by Bamboo partner institutions and organizations:

- may be listed and linked to other elements in the Bamboo Service Atlas, and accessed via the Bamboo Exchange;
- may be deployed in a standard "Bamboo Appliance" if the service meets some minimal alignment to Bamboo deployment infrastructure; or on some other infrastructure operated by the host institution or organization (a less-preferred alternative once a "Bamboo Appliance" is available);
- will not be supported by any consortial guarantees of quality (Service Level Agreements, SLA);
- will express the level of service quality that is guaranteed by the host;

- may originate in service development work done by a Bamboo Member or by others;
- will, if the service originates in work outside the community of Bamboo Membership, be deployed in a separate and clearly differentiable "Incubator" context, modeled on the "entry path" concept that underlies the W3C and Apache incubators;
- may utilize compute, storage, and network resources within the service-hosting infrastructure; or may "wrap" requests for resources provided elsewhere;
- will require some form of identification (e.g., user or application ID) in order to track usage and facilitate notification of service outages or other changes; and,
- will be made available to scholar-users without membership-related restrictions - that is, scholars affiliated with institutions or organizations who are not involved with Project Bamboo, and (tentatively) scholars not affiliated with any institution or organization.

4.3.2 Common Services

Services of broad, deep, or otherwise valuable utility may become candidates for refinement into "Common Services." Service interfaces that have been refined through a process of architectural modeling, design, alignment to applicable standards, and coordination to maximize interoperability, then developed as production-ready reference implementations, will be considered "Common Services." As such, they can and will be deployed by Bamboo member institutions for use by the global community of scholars in a redundant, distributed network of Bamboo Appliances that comprise the Bamboo Cloud. These services will include those that enable core digital infrastructure of the Bamboo Community (the Services Atlas and its component entities; and the Bamboo Exchange, including its elements). Additional services will deliver direct support to scholarship by enabling Scholarly Networking (cf. Section 3 of the Bamboo Program Document) and automating workflows (recipes) that add value to the arts, humanities, and interpretive social sciences. Some classes of service will provide resources delivered directly from servers operated by Bamboo member institutions; while others will wrap (call) or refer to compute, storage, and/or service-delivery resources operated by others. Service Level Agreements for services offered from the Bamboo Cloud, as well as those for underlying services hosted elsewhere, will be clearly articulated to service consumers.

Common Services deliver qualities that the Bamboo Consortium guarantees. These will address sustainability, stability, availability, composability (i.e., usability in multiple workflows), standards-compliance, scalability, and robustness. Architectural coherence is also a key quality of Common Services, intended to forestall problems that would otherwise follow from a scatter of arbitrary decisions (not related to delivery of functionality) that might be made if development is not constrained by architectural principles and a standards orientation. With the exception of services deployed in close proximity to distributed tools or content, Common Services are expected to be deployable on a standard Bamboo Appliance for service-delivery. Common Services will support or permit usage tracking (technical and functional), and add value to scholarship in the arts, humanities, and interpretive social sciences. A fundamental aspect of the commonality of

"Common Services" is their composability into multiple workflows ("recipes") and interoperability with one another.

Once a service is accepted at the Bamboo Plan layer as a candidate, there is a set of refining activities that must occur before it is capable of delivering the qualities enumerated above, and is thus eligible to be considered a "Common Service." *The current draft of this document does not attempt to enumerate these activities.*

Existing services may be proposed for "Common Service" candidacy by Bamboo Members. A usual path to candidacy includes evolution of a service to a point where it is deployed, used, and studied in a Local or Incubator context (see Local and Incubator Services, above). Bamboo Members with responsibilities in the Plan areas of work will actively seek to identify candidates from services emerging in the larger world of digitally-enabled scholarship, as well as within the Bamboo Exchange, Local Services, and Incubator Services contexts. Anyone may propose a service or set of services to Bamboo as potential candidates. Services emerge as candidates for refinement into Common Services because they:

- are, or are potentially, of broad, deep or otherwise valuable utility to one or multiple areas of scholarly practice in arts, humanities and/or interpretive social science;
- would provide, in appropriate proportion to the effort and resources needed to evolve them, greater value if engineered to deliver Common Service qualities;
- abstract or may, with relative ease, be refactored to abstract basic/utility functions and entities (such as authorization or persistence functionality; and entities representing a person or organization);
- separate generally-applicable functionality from that which is specific to particular domains or corpora;
- exist already, fit well within, or may, with relative ease, be refactored to fit well within loosely-coupled architectures;
- already run or can, with relative ease, be refactored to run atop stable, well-supported open-source technology stacks;
- are implemented using good coding and documentation practices; and,
- take and return standards-compliant input and output, or can, with relative ease, be refactored to do so.

Services that exist only as concepts must be adopted by a service design/development team in order to advance the concept to a point at which it can be meaningfully considered for candidacy, as described above. Such development teams may be Bamboo Members or not, and may have institutional, organizational, disciplinary, functional, or other focus.

Some classes of Common Services will provide resources delivered directly from servers operated by Bamboo member institutions; while others will wrap (call) or refer to compute, storage, and/or service-delivery resources operated by others. Service Level Agreements (SLAs, cf. Glossary) for services offered from the Bamboo Cloud, as well as

those for underlying services hosted elsewhere, will be clearly articulated to service consumers.

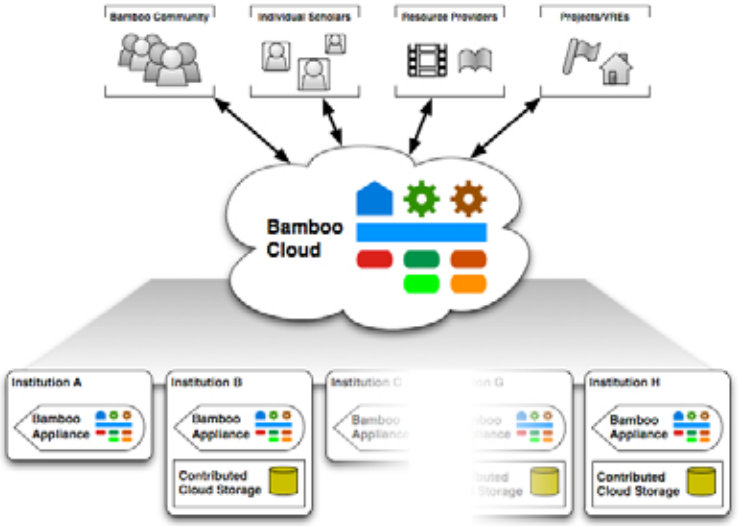
An initial set of Common Services will enable core digital infrastructure of the Bamboo Community (the Services Atlas and its component entities; the Bamboo Exchange, including its elements; and services that enable Scholarly Networking).

4.3.3 Bamboo Service-Delivery Appliances and the Bamboo Cloud

A "Bamboo Appliance" for service-delivery is expected to evolve as a standardized (probably virtual) server provisioned with a technology stack on which services may be deployed and made available for consumption. A number of distributed Bamboo Appliances will respond to service requests addressed to and routed from the Bamboo Cloud, via a mechanism that provides load-balancing, fail-over capability, and diagnostics of the "health" of constituent appliances. It will also be possible to request and receive service functionality from a Bamboo Appliance directly (e.g., via Local and Incubator deployment contexts described above).

Bamboo Members active in the Plan layer of the consortium will be responsible for defining the architecture and technology requirements for this appliance and for the Bamboo Cloud; Bamboo Members active in the Build layer will be responsible for implementing, testing, distributing, and maintaining them. Bamboo Appliances and the Bamboo Cloud will be constituted on a technology platform (or combination of technology platforms) identified in the Bamboo Plan layer of activity. Some technologies that may be considered include cloud services provided by commercial vendors; and open-source infrastructures such as Eucalyptus, Nimbus, and Sun Microsystem's Open Cloud Platform.

An early conceptual diagram of appliances supporting a "cloud" from which services may be accessed follows:



Bamboo Service Delivery Appliances and the Bamboo Cloud. This diagram is a very preliminary, rough, and tentative conceptual model of a set of Bamboo Appliances comprising the Bamboo Cloud.

Services delivered from Bamboo Appliances will, in some cases, provide resources delivered directly from the Appliance; while others will wrap (call) or refer to compute, storage, and/or service-delivery resources that originate elsewhere. Service Level Agreements (SLAs, cf. Glossary) for services offered from Bamboo Appliances or from the Bamboo Cloud, as well as those for underlying services hosted elsewhere, will be clearly articulated to service consumers.
An early set of services will offered from the Bamboo Cloud will be those that enable core digital infrastructure of the Bamboo Community (the Services Atlas and its component entities; the Bamboo Exchange, including its elements; and services that enable Scholarly Networking). Some content is likely to be hosted in the Bamboo Cloud, including content related to the Services Atlas, Bamboo Exchange, Scholarly Networking infrastructure, and related Bamboo community endeavors; the appropriateness and extent of Bamboo cloud-hosting for digital content such as primary and secondary sources of scholarly interest will evolve over time, in accordance with community-directed decision making processes, partnerships, and resource availability.

The technology stack that enables service delivery is conceived as a "Bamboo Service Platform." It will be composed from existing, open-source technologies such as service

containers, service buses, and orchestration engines, and provide the means to host and deliver services to the community.

4.4. Tool and Application Alignment Partnerships

Bamboo will partner with interested tool and application projects and developers to wrap and/or deliver functionality (automation capabilities) as services that can be deployed alongside, and interoperate with, Bamboo Common Services. By exposing capabilities from other projects and providers as Bamboo-affiliated services, broader and more diverse uptake of those capabilities is more likely; such exposure will also enrich the pool of service candidates being considered for refinement into Bamboo Common Services. These partnerships will deepen and broaden the Bamboo ecosystem with expertise and experience rooted in domain- and function-centric communities.

Some of the most fertile ground for development of automation capability in arts, humanities, and interpretive social science scholarship to date has been in discipline- or tool-focused communities and projects, such as (but in no way limited to) ARTFL, MONK, the Perseus Digital Library, SEASR, and Zotero. As the technology landscape evolves toward delivery of decomposed functionality as services, some discipline- and tool-focused projects will likely be interested in delivering their capability in an architecture congruent with Bamboo's. This will present opportunities for partnership.

In collaborative negotiation with projects whose valuable algorithms and implementations can be enhanced by alignment and partnership with Bamboo architecture, mutually beneficial incentives will be defined and exchanged to best advance scholarship as a whole in the arts, humanities and interpretive social sciences. Broader and more diverse uptake of partner-delivered capabilities is a likely incentive Bamboo can offer. In the other direction, Bamboo will benefit from enrichment of the pool of service candidates being considered for Local and Incubator deployments and refinement into Bamboo Common Services, and from an ecosystem deepened and broadened by expertise and experience rooted in domain- and function-centric communities.

4.5. Content Interoperability Partnerships

Bamboo will partner with interested content (digital resource) providers to enable Bamboo Common Services to discover, search, and appropriately operate on their diverse and distributed holdings. Similarly, partnerships with interested repository platform providers will enable Bamboo Common Services to discover, search, and appropriately operate on resources hosted on platforms of strategic value to communities of arts, humanities, and interpretive social science scholarship. These efforts will likely take the form of modeling, implementing, and deploying service interfaces that conform to extant and emerging standards to expose strategically identified content stores and platforms. Bamboo-facilitated exposure of content via service interfaces will broaden uptake and trans-disciplinary opportunities for scholarship, as well as suggest additional candidates for refinement into Bamboo Common Services.

Objects of scholarly interest - "content" or "digital resources" in a world of bytes and networks - are the gravitational centers around which much or most scholarship in the arts, humanities, and interpretive social sciences orbits. Improving the ability of scholars to discover, inquire of, compare, integrate, decompose, and re-integrate objects of interest that reside in diverse repositories, as well as to digitize and store additional objects-of-interest, are fundamental goals of cyberinfrastructure in the academy, and key interests expressed by many participants in Bamboo workshops and in other venues - from blogs to white papers - focused on what IT can do for scholars.

Bamboo will therefore partner with library, archive, and repository partners, and those who deliver platforms on which digital repositories are hosted and accessed, to collaboratively develop interfaces and content-transformation services that will maximize exposure of unique features of diverse partners, while leveraging commonality or similarity by conforming to extant and emerging standards to broaden the field of inquiry and operation over diverse and distributed content repositories. These partnerships are likely to look to existing initiatives around the Open Content Alliance, the Internet Archive, the Digging into Data Challenge, and similar content-centric efforts; as well as standards-body and library-driven specifications for publishing digital resources such as OAI-PMH (Protocol and Metadata Harvesting), OAI-ORE (Object Resuse and Exchange), XTF(eXtensible Text Framework) and Jangle(AtomPub for library resources), to build upon a range of experience and practice in capture, archiving, discovery, and dissemination of digital content.

Intellectual Property issues are likely to play a part in any content interoperability efforts.

4.6. Section Glossary

This quickly-assembled glossary explains some of the terms used in this draft.

- Activities - Steps (units of work, process, or procedure) that occur in the course of tasks or workflow that comprise scholarship. Cf. Activity Definitions.
- API - cf. Application Programming Interface in this glossary.
- Application ID - An alphanumeric string or other token of identification that ties usage of a service to another piece of software, such as another service or an application.
- Application Programming Interface (API) - Instructions explaining how a body of software may be used to gain the benefit of its functionality. (From Wikipedia: a set of routines, data structures, object classes and/or protocols provided by [software] libraries and/or operating system services in order to support the building of applications.)
- Bamboo Appliance - Shorthand for a 'service-delivery appliance' - a standardized (probably virtual) server provisioned with a technology stack (cf. Bamboo Service Platform in this glossary) on which services (e.g., web services) may be deployed and made available for use.

- Bamboo Cloud - A collection of service-delivery 'applicances' (cf. Bamboo Appliance in this glossary) that collectively and redundantly, using load-balancing and fail-over mechanisms, hosts Bamboo Common Services (cf. 4.3.2 - Common Services, above)
- Bamboo Service Platform - A set (stack) of technologies that provides the means to host and deliver services from a Bamboo Appliance (cf. Bamboo Appliance in this glossary).
- Capability - In a service, a piece of work that the service can deliver on request.
- Common Services - Cf. 4.3.2 - Common Services (above).
- Narratives - Cf. "Scholarly Narratives" in this glossary.
- Operation - A call (request) that can be made to a service to execute some piece of work, with formally defined input, output, and error messages
- Recipes - Recipes describe how to achieve goals using information technology. Recipes are written for scholars and describe the tools and steps needed to complete a task in non-technical language. In short Recipes are built on the stories academics tell about what they want to do by generalizing to shared tasks and they allow Bamboo to organize technology to support those tasks. Cf. Recipes.
- Refactor - (from Wikipedia): "The process of changing a computer program's internal structure without modifying its external functional behavior or existing functionality. This is usually done to improve external or internal non-functional properties of the software, such as code readability, to simplify code structure, to change code to adhere to a given programming paradigm, to improve maintainability, or to improve extensibility."
- Scholarly Narrative - Expression of a particular aspects of scholarship, scholarly workflow, research, and/or teaching from a scholar's perspective, and in her own language. Cf. Scholarly Narratives Working Group.
- Shared Technology Service - cf. Service, below.
- Service - A unit of software that delivers a related set of capabilities. Services implement functionality (capabilities) that have been decomposed then logically grouped to flexibly facilitate (a) interoperability with other software and/or digital content; and/or (b) combination and recombination with other services in support of multiple tasks or workflows.
- Service Atlas - A collection of information - some general some detailed - that in its expression and linkages permits individuals with different interests, skills, and perspectives to understand the nature and utility of services, their purpose and relevance, and the body of work they are meant to support. Cf. 4.1 - Services Atlas (above).
- Service Candidate - A concept for a service. A grouping of capabilities modeled as a set appropriate for designing and implementing as a single service.
- Service Contract - A formal expression of Service Design (i.e., operations and message structures, as well as additional information and parameters necessary to execute operations offered by a service).
- Service Design - The operations and message structures (input, output, error), as well as additional information and parameters necessary to execute operations offered by a service.

- Service Endpoint - The location (generally on a network, such as the internet) where an existing, operating service can be accessed (called) in order to request delivery of its functionality. A service endpoint is to a service what a URL is to a web page; in the familiar case of a web page, calling http://www.google.com in a browser fetches a web page from Google.
- Service Level Agreement - An agreement describing a measurable level of service guaranteed by a service provider to a service receiver.
- Service Model - A rough expression of capabilities that a service is expected to offer; less detailed and formal than Service Design, but more so than a Service Candidate.
- Service Family - A group of related services.
- SLA - Cf. Service Level Agreement, above.
- User ID - An alphanumeric string or other token of identification that ties usage of a service to an individual (whether anonymized or not)

5. Bamboo Labs

Although a wide range of programs, technologies, and possibilities are outlined for Bamboo, these elements merely reflect the ideas and outputs individuals who work together across boundaries to enhance arts and humanities instruction, practice, research and scholarship. The diverse range of scholars and researchers, specialists and technologists who participate in and contribute to the community ultimately define Bamboo. That diversity is reflected in the organization that ties Bamboo together.

5.1. Diversity, Innovation and Labs

The model for the organization of Bamboo can trace several ideas to:

- community source projects such as Kuali and Sakai;
- crowd-sourcing approaches common to Wikipedia, Shutterstock and recent political movements;
- formal standardization and specification bodies such as the IEEE Standards Association and the IMS Global Learning Consortium; and
- open source activities such as Apache and Mozilla.

Within each of the larger organizations listed above are smaller communities that focus on particular projects, tasks, or dimensions that contribute directly to the greater effort. For example, in Wikipedia a small team may work together to manage a set of content pages whereas in Kuali a subset of the larger community can represent a multi-institution effort to create a next-generation student system. What is important to note in both of these examples is that the larger entity (Wikipedia and Kuali) plays an organizing and administrative role whereas the smaller group (content editors and student system project

partners) focuses on completing the project or managing a specifc activity in the manner that best suits the group of participants.

Bamboo, then, functions at the larger level by establishing and maintaining a community of individuals, projects, and institutions that are interested in working together. It also provides the administrative support and organizational context for ongoing effort. Within the larger organization are the individual projects and diverse activities that ultimately define Bamboo. These "labs" may be organized around the first implementation phase of Bamboo, could represent a small community of scholars working together to develop a service for sharing digital image references in art history, or be a team of computer scientists and choreographers looking to use shared services in support of virtual performance.

What is important to separate between the larger effort of Bamboo and the labs are the ideas of innovation and exploration. Just like efforts in Apache and the IEEE, some labs will succeed and others will not. The idea of structuring collaboration around the lab model is to encourage discovery and innovation with as little administrative overhead as possible. If a lab is successful and the outcome contributes to the broader Bamboo Community, then Bamboo itself shall have mechanisms to evaluate and transfer research and development into something more mature for all to use.

Finally, Bamboo itself can be thought of a lab - an effort that is continually evolving to meet the next wave of challenges facing researchers, educators, students, and technologists.

5.2. An Ecosystem of Projects and Initiatives

Bamboo is much more than a cyberinfrastructure, e-research, or e-infrastructure initiative; it represents a range of interlinked activities, individual projects, and related endeavors that form an ecosystem of collaborative effort. It exists within an even larger macroecology of academic disciplines, professional fields, and technical environments. As such, it is important that Bamboo strives to fit in wherever possible as it is a component of a larger array of systems and ecologies.

As an ecosystem, Bamboo will inevitably be affected by forces both within and external to the environment and at times, beyond its control. Resource availability, disciplinary interest, the financial climate, member participation, agency investment, and community readiness are some of the myriad forces that may be in play within the Bamboo ecosystem at any given time. Because of this, the organization must be flexible enough react quickly when forces shift, yet solid enough to withstand a major change without collapsing. To accomplish this, the community should adhere to a common set of principles to guide the ecosystem's growth and maturity. That said, Bamboo should:

1. promote innovation through sharing and collaboration,
2. respect the diversity of its members,
3. seek consensus,

4. implement solutions for the common good, and
5. evolve as needs and interests change.

5.2.1 Levels of Engagement

Bamboo incorporates a number of interlinked layers of activity from a wide range of individuals, projects, and organizations. It can reflect the work of a single scholarly endeavor, share the collective energy of a global community, do both or present something in between. Each of these layers can be characterized by a level of engagement within Bamboo.

5.2.1.1 Bamboo Community

The Bamboo Community consists of individuals, groups, organizations, and institutions that have expressed interest in staying connected with Bamboo or using freely available services and resources delivered by Bamboo. For example, this would include all individuals who subscribe to any Bamboo mailing list, RSS feed, Flickr feed, or Facebook group, as well as anyone who chooses to use a service or capability delivered by Bamboo. Through taking intential action to connect with Bamboo, one expresses their material interest in Bamboo and as such, joins the community. The community would consist of everyone engaged with Bamboo which could include:

- arts, humanities, and social sciences faculty;
- computer scientists and software engineers;
- library and information scientists;
- information technologists;
- content developers and providers;
- representatives from industry, projects, and consortia;
- members of foundations and agencies; and
- others who have a material interest in advancing arts and humanities research and scholarship

5.2.1.2 Bamboo Members

A Bamboo Member is a project, group, organization, or institution that is active in the Bamboo Community and formally commits resources toward the growth and development of Bamboo. In brief, members:

- coordinate activities within the community,
- undertake and promote projects,
- shape and refine the scope and direction of Bamboo,
- liaise with other organizations, and
- lead Bamboo-wide initiatives.

In addition, members can take full advantage of the Bamboo Exchange by listing and exchanging services and resources with other Bamboo members. Finally, members have the opportunity to participate in the leadership and governance of Bamboo.

5.2.1.3 Bamboo Affiliates

A Bamboo Affiliate is a commercial organization that is has a material interest in Bamboo, its vision, scope and program, and is willing to participate in Bamboo as a Member.

5.2.2 Investment

A breadth of expertise and resources are needed to enable Bamboo to build connections across the community, foster joint projects, and sustain efforts and activities over time. Therefore, an ongoing investment in Bamboo is essential to sustaining the community and the ecosystem around it.

There are two dimensions to investment: financial and resource. A financial investment takes the form of annual membership dues whereas a resource investment can take a number of forms that include (but are not limited to):

- financial
- project-specific staffing
- technical investment such as storage or computational capacity
- community coordination
- annual donation of access to content for the community

A resource investment is expressed as a financial equivalent of either the resource or time. As an example, a member may contribute both server virtualization and storage capacity to Bamboo, and that would be expressed as equivalent dollars over the membership period. In the case of an individual's time, that would be expressed as a full time equivalent (FTE) rounded to the nearest single decimal or tenth.

For both Bamboo Members and Affiliates, a combination of a financial and resource investment is required for membership.

5.2.2.1 Bamboo Community

To participate at the community level, no resource commitment beyond an individual's personal interest is required.

5.2.2.2 Bamboo Members

Financial Investment: **to be discussed**

Resource Investment: **to be discussed**, but may include access to experts, time, software, hardware, staffing, storage, hosting, etc.

5.2.2.3 Bamboo Affiliates

Financial Investment: **to be discussed**

Resource Investment: **to be discussed**, but may include access to experts, joint research, time, software, hardware, staffing, storage, hosting, etc.

5.3. Structure

There are multiple structures and layers that coexist within the environment of Bamboo. Some structures define classes of activity or methods of collaboration whereas others identify layers of contribution. As outlined in the "Scope & Work Plan," Bamboo is structured around three clusters of activity: Bamboo Explore, Bamboo Plan, and Bamboo Build. These three structures provide the context for labs to be created, sustained, and delivered.

To encourage coordination of effort and open collaboration, all labs shall undergo an organizational approval process at the Leadership Committee level (see 5.5.1 below) and if authorized, be formally organized with an appropriate charter, have a reasonable reporting requirement, and be announced openly within the Bamboo Community.

5.3.1 Bamboo Explore

Bamboo Explore is responsible for developing, growing and nurturing the Bamboo Community. Explore observes and analyzes the community's adoption and use of Bamboo services, tools, and programs and recommends ways in which Bamboo can evolve and adapt to changing needs. Explore:

- observes and reacts to community needs,
- connects activities, and
- contextualizes action and use.

Given its close relationship with the broader Bamboo Community, Explore shall be actively engaged with the various activities of The Forum.

Labs within Bamboo Explore may include (but not be limited to) the formation of special interest groups around textual analysis or data mining; joint projects to investigate models for educating graduate students about shared services and resources; workshops on evolving models of shared digital scholarship; exploring new ideas for shared gadgets and services; or hosting activities to gather information and ideas on the latest models of technology-enhanced research and pedagogy. The output of Explore Labs can directly benefit the Bamboo Community by coordinating activities (such as the workshops) or directly influence the direction of Bamboo itself by coalescing community-wide ideas

into recommendations for Bamboo to further develop. In the latter case, such recommendations would be passed along to Bamboo Plan.

5.3.2 Bamboo Plan

Bamboo Plan is responsible for planning infrastructure, formally expressing Bamboo standards, guidelines and practices, and liaising with other consortia, societies and organizations. Plan:

- acts on input from Explore,
- filters recommendations, and
- prioritizes action.

In addition, Plan shall be actively engaged with and ultimately define the elements of the The Cloud, including the architecture, standards, and the appliance model.

The fundamental perspective of Bamboo Plan is to enable innovation in research, teaching and learning through interoperable shared services and technologies that respect the needs of scholars. This perspective shall be balanced against usability, scalability, and sustainability. Because of this, Plan shall operate in a formal manner where decisions, recommendations, etc. are documented and shared openly with the Bamboo Community.

Plan Labs focus on translating ideas from Explore into something for the community as whole either through formal adoption or further development by Bamboo Build or evaluating options and determining an appropriate course of action either within Plan or Build or through a liaison. For example, an Explore Lab acting as a special interest group around textual analysis may recommend the modification of a particular markup scheme to make it easier for a class of problems to be tackled computationally. Passing the recommendation on, Plan takes up the recommendation and determines if Bamboo should undertake the recommendation to develop something, pass it on to a liaison organization, or to examine the recommendation to see if it fits within another Bamboo activity. Plan may take the recommendation and jointly create a lab for the textual analysis lab, members of Plan, and representatives from a liaison organization to work together to incubate the idea into something of potential benefit to the larger community.

5.3.3 Bamboo Build

Bamboo Build is responsible for creating the components deemed essential to the Bamboo Community, implements software components of Bamboo infrastructure and shared services, and manages the technology layer of Bamboo itself. Build shall work closely with Plan on the development and maintenance of The Cloud.

Acting on the direction of Plan, Build Labs concentrate on adopting, transforming, or creating technology for the Bamboo Community. Given the appliance model behind The Cloud, one Build Lab will focus on the Bamboo Appliance which shall be a joint effort with Plan.

5.4. Liaisons

An important aspect to Bamboo is its ability to formally liaise with other organizations, consortia, projects and initiatives in order to share ideas, minimize duplication of effort, and promote the use of already established standards, specifications, and practices. Although numerous informal connections undoubtedly exist between participants in the Bamboo Community, formal liaison relationships are necessary to connect Bamboo activities with the work of other groups.

A Bamboo Liaison is a special role for a Bamboo Member where the member takes on a formal representative relationship with a specific organization on behalf of Bamboo, its members, and the community. Formal communication between the organization and Bamboo is passed through the liaison to ensure that Bamboo adheres to the processes and procedures of the other organization, and that issues raised by the other organization are officially heard and potentially acted upon by Bamboo. For example, an organization may require three months advance notice along with supporting documentation for a topic to be raised at a meeting. The Bamboo leadership may not be aware of such a requirement, but because a member is the designated Bamboo Liaison, she can ensure that the proper steps are taken to add an item to the other organization's agenda and when the time comes, she could present on Bamboo's behalf if necessary or lead a larger Bamboo team in a joint dialogue.

Bamboo Liaisons shall be formally recognized and authorized by the Bamboo Plan Leadership Committee. That said, the liaison relationship with an outside organization may intersect and engage with a specific activity or function anywhere within Bamboo as appropriate. Plan simply needs to authorize and manage the formal relationship; what is most important beyond that is the open line of communication between the appropriate place within Bamboo and the outside group.

5.5. Governance

The governance model for Bamboo is based on a moderately decentralized approach of three leadership committees (one for each area of Explore, Plan, Build), a Bamboo Board that has representatives from the leadership committees and the broader community, and an executive director that is part of an overall Bamboo Office.

5.5.1 Leadership Committees

There shall be three leadership committees that will be responsible for coordinating the activities and programs in each area:

- Bamboo Explore Leadership Committee
- Bamboo Plan Leadership Committee
- Bamboo Build Leadership Committee

The Leadership Committees shall collaborate as needed to ensure the smooth transition and coordination of projects, plans, activities and initiatives between Explore and Plan as well as Plan and Build. In addition, the Leadership Committees shall act as coordinating entities around and among the various labs within Bamboo.

5.5.2 Bamboo Board

Representatives of each Leadership Committee, an elected set of Members-at-Large, and the Executive Director shall constitute the Bamboo Board. The Bamboo Board shall determine policy, strategy and direction for Bamboo. The Board shall work together to ensure Bamboo is headed in appropriate direction and provide guidance to the three leadership committees as necessary.

5.5.3 Bamboo Office

One institution shall administer the business-related activities of Bamboo and appoint the Executive Director to be responsible for those activities. Such work may include (but not be limited to) managing the finances for the organization; planning and coordinating community-wide events; assisting with regional activities; coordinating programs and initiatives; handling community development, marketing, and communications; assisting with grants and initiatives that want to engage with the Bamboo Community; and acting as the project sponsor for ongoing Bamboo infrastructure efforts.

In addition to the business-related functions, the executive director shall formally represent Bamboo when needed, act as a neutral party in Bamboo leadership meetings, and chair the Bamboo Board.

6. Indices

To be added at a later date.

6.1. Scholarly Practices

6.2. Services Atlas

6.3. Planning Project Participants

6.4. Planning Project Demonstrators

6. GLOSSARY

To be added at a later date.