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What Ever Happened to Project Bamboo?

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Abstract

This paper charts the origins, trajectory, development, challenges, and conclusion of Project Bamboo, a humanities cyberinfrastructure initiative funded by the Andrew W. Mellon Foundation between 2008 and 2012. Bamboo aimed to enhance arts and humanities research through the development of infrastructure and support for shared technology services. Its planning phase brought together scholars, librarians, and IT staff from a wide range of institutions, in order to gain insight into the scholarly practices Bamboo would support, and to build a community of future developers and users for Bamboo's technical deliverables. From its inception, Bamboo struggled to define itself clearly and in a way that resonated with scholars, librarians, and IT staff alike. The early emphasis on a service-oriented architecture approach to supporting humanities research failed to connect with scholars, and the scope of Bamboo's ambitions expanded to include scholarly networking, sharing ideas and solutions, and demonstrating how digital tools and methodologies can be applied to research questions. Funding constraints for Bamboo's implementation phase led to the near-elimination of these community-oriented aspects of the project, but the lack of a shared vision that could supersede the individual interests of partner institutions resulted in a scope around which it was difficult to articulate a clear narrative. When Project Bamboo ended in 2012, it had failed to realize its most ambitious goals; this article explores the reasons for this, including technical approaches, communication difficulties, and challenges common to projects that bring together teams from different professional communities.

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1 Introduction

Project Bamboo was a humanities cyberinfrastructure initiative funded by the Andrew W. Mellon Foundation between 2008 and 2012, in order to enhance arts and humanities research through the development of infrastructure and support for shared technology services. In 2008, the Mellon Foundation funded a joint proposal for UC Berkeley and the University of Chicago to conduct a planning process that would gather feedback from scholars, librarians, and IT staff from a wide range of institutions, and build a community of future developers and

users for Bamboo's technical deliverables. Where project staff anticipated 200 attendees representing 75 institutions, over 600 ultimately participated, representing more than 115 institutions.¹

This article charts the origins, trajectory, development, challenges, and conclusion of Project Bamboo, from its initial funding through the months immediately following its conclusion. The article is an expansion of the author's presentation at *Digital Humanities 2013*, with the goal of providing background and context for further discussion within the digital humanities community about lessons that can be learned from this project.

Material for this article has been drawn from a number of sources, most prominently the public Bamboo wikis,² supplemented by the author's own memory, that of colleagues, and email records.³ While this article largely deals with the facts of Project Bamboo, a layer of interpretation is inevitable, particularly as pertains to the factors contributing to the project's failure to realize its most ambitious goals. The conclusions drawn are the author's own, and neither a product of consensus among the participants nor an official statement on behalf of Project Bamboo, the University of Chicago, UC Berkeley, or the Mellon Foundation.

2 Origins

In the mid-2000s, discussions about cyberinfrastructure emerged in higher education IT circles, including EDUCAUSE and the Coalition for Networked Infrastructure. Future Bamboo project co-director Chad Kainz, then the senior director of Academic Technologies within the University of Chicago's central IT unit, saw a role for cyberinfrastructure, and what would come to be known as cloud computing, in addressing the following issues he had encountered while supporting digital humanities projects:

- (1) at least two-thirds of the time spent on typical humanities technology projects was spent on developing the technology rather than focusing on the scholarship,
- (2) many of the projects centered on either 'yet another database' or 'yet another website', and
- (3) the technologies that were ultimately created for the projects in question were developed before, but for different contexts, thus 're-inventing the wheel'. (Kainz, 2010)

At the 2006 EDUCAUSE Seminar on Academic Computing, Kainz discussed support for digital humanities with Chris Mackie, at that time an Associate Program Officer for the Research in Information Technology (RIT) program at the Mellon Foundation. For Mackie, the issues that Kainz identified also led to frustrations for funding

agencies: foundation funds were being directed toward the development of software that would likely not be reused and the creation and presentation of data that could spread no further than a single Web site or database, rather than substantively furthering humanities scholarship. Mackie encouraged Kainz to partner with David Greenbaum, the UC Berkeley Director of Data Services and future Bamboo co-director, to initiate a Mellon-funded project that would address these issues. Based on feedback from Mackie, Kainz and Greenbaum revised an initial technology development proposal into a community-driven technology planning project.

3 Bamboo planning project proposal

The Bamboo Planning Project proposal identified five key communities whose participation was seen as crucial for the project's success: humanities researchers, computer science researchers, information scientists, librarians, and campus technologists.⁴ Anticipating—if understating—the root of many of the challenges that would arise in the workshops, the proposal noted that '[e]ach community has distinctive practices, lingo, assumptions, and concerns; and clearly there is much diversity within each community as well' (Project Bamboo, 2008, p. 6). The proposal drew extensively on information and examples shared by 50 representatives of these five communities at UC Berkeley who attended an all-day focus group at the Townsend Center for the Humanities in November 2007. Perspectives from University of Chicago faculty and staff also contributed to the view of the then-current landscape of digital humanities depicted in the proposal. While both UC Berkeley and the University of Chicago are leading research institutions with strong programs in the humanities and a number of longstanding digital humanities projects (e.g. ARTFL at the University of Chicago, and the Sino-Tibetan Etymological Dictionary and Thesaurus at UC Berkeley), these projects were more the exception than the norm, and faculty members at these institutions were not highly involved in the leadership of large digital humanities

organizations, in 2007. As such, while the depiction of the digital humanities landscape in the proposal may have been accurate for some faculty members at research institutions, it reflected neither the experiences and concerns of many noteworthy digital humanists, nor those of scholars at small liberal arts schools, though both groups participated in Bamboo's workshops. This omission, while difficult to avoid at such an early stage, opened the project up to criticism.⁵

In the context of the Bamboo Planning Project, the role of the humanities scholar was to share information about methods, practices, and workflows, paying particular attention to 'pain points' and areas where current tools and services were inadequate. Technologists and librarians would then construct a proposal for the development of new services and underlying infrastructure to support scholarship in the humanities. The Bamboo planning proposal did not significantly treat the possibility that humanists might focus on needs that *could not* meaningfully be addressed through the development of technology.

The proposal specified the two models that the infrastructure and scholarly services would draw from: large enterprise SOA practices for scalability, management, cost-effectiveness, and long-term stability on one hand, and mash-ups, which emphasize ease, flexibility, and fast innovation on the other (Project Bamboo, 2008, pp. 15–16).

The Bamboo planning proposal charted a direct path from the expression of scholarly practices⁶ within and across disciplines (in the first workshop) to systematizing those practices into defined scholarly workflows that could be used 'to derive commonalities and unique requirements related to practices, functions, barriers, needs, and existing and potential transformations at the disciplinary level', to developing 'a community-endorsed technology services roadmap for scholarship', along with organizational, staffing, and partnership models to support those services. It anticipated that 'arts and humanities scholars [would] begin to shape technology options by questioning impacts of potential technological choices, clarifying misinterpreted goals and ultimately co-determining a roadmap of goals to pursue, tools to provide,

platforms on which to run, and architecture to use' (Project Bamboo, 2008, p. 24). SOA would play an increasingly prominent role as the workshops progressed.⁷

Between the workshops, participants would propose pilot projects that would be undertaken by Bamboo program staff. These pilot projects would 'be based on industry-accepted practice and open standards for a services-oriented architecture' and would 'present . . . a tangible expression of how services can function . . . facilitate understanding and critique . . . our process, as well as clarify our semantics and goals' (Project Bamboo, 2008, p. 28).

According to the plan, by the end of the Bamboo Planning Project, the initial group of 200 participants from 75 institutions would be narrowed down to 30 participants from the 15 institutions that would move ahead with implementing a robust, scalable web services framework and a set of services that aligned with scholarly practice in the humanities, as defined by participating scholars. In reality, this plan changed dramatically when faced with the interests and priorities of actual humanities scholars.

4 Bamboo planning workshops

One of the hallmark traits of the Bamboo planning workshops was their flexibility—on more than one occasion, plans and agendas that had been painstakingly prepared over weeks were discarded and completely rewritten after a frustrating morning session. This began with the first iteration of workshop 1 (held in Berkeley, 28–30 April 2008). After high-level presentations on Bamboo, its approach, and its methodology, participants were asked to name abstracted scholarly practices (as verb + direct object), provide a description, identify applicable domains, cluster those practices, and then repeat the process for emerging scholarly practices, while scribes filled in an Excel spreadsheet template with different tabs for each exercise. Faculty participants were particularly turned off by the technical jargon in the presentations (including 'services', as commonly understood by IT staff), and the program staff's pushing for immediately abstracting

verb + direct object ‘scholarly practices’ instead of facilitating a conversation about what scholars do. The spreadsheet was emblematic of the disconnect between the plan for workshop 1 and what scholars believed was needed, as it was unable to capture the narrative of their discussions. By the second day of the workshop, the exercises took on a less rigidly structured form, and this informed the process used with greater success in the subsequent three iterations of workshop 1.⁸

At the time, the incident at the first workshop 1 was largely interpreted as a tactical misstep, rather than the beginnings of a challenge to the entire premise and planned approach of Project Bamboo. After the completion of the workshop 1 series (28 April–16 July 2008), work continued as defined in the proposal: program staff aggregated the notes taken during the workshop 1 meetings, and distilled from that material a set of ‘themes of scholarly practice’⁹ to present at workshop 2 (15–18 October 2008). Program staff also prepared and presented an introduction to SOA in the context of Bamboo, intended to link the themes of scholarly practice to the planning for future technical development that would be the focus of subsequent workshops.

This approach to workshop 2 backfired. While developing the themes of scholarly practice, program staff had created accounts for over 400 workshop 1 participants on the project wiki, anticipating that they would actively contribute to the process of theme distillation. The minimal uptake (six contributors, each making a few edits) was interpreted as a consequence of humanists being unaccustomed to using a wiki for scholarly discussions, compounded by the unintuitive interface of the Confluence wiki platform. In person, however, it quickly became clear that what scholars found unintuitive was the program staff’s approach of presenting their livelihood back to them as a set of ‘scholarly practices’. Already frustrated by the seemingly purposeless decontextualization and misrepresentation of scholarship in the humanities, many workshop 2 attendees were not disposed to attempt to make sense of the technical language and the ‘wedding cake’ diagram used to present the SOA component of the project. In heated Q&A sessions, some participants went so far as to challenge the

legitimacy of a cyberinfrastructure initiative for the humanities led by IT staff rather than by humanists themselves.

During workshop 2, it became clear that ‘community design’ could not simply mean that the community would deliberate the details of a web services framework. The community had spoken and made it clear that continuing to emphasize SOA would alienate the very members of the community Bamboo was intended to benefit most: the scholars themselves. While a web services framework would continue to play an important role in the project, it was represented in only one or two of the six working groups¹⁰ established at workshop 2. The other groups focused on topics drawn from the themes of scholarly practice, with the exception of ‘Stories’ (later renamed ‘Scholarly Narratives’), a last-minute addition to address concerns about the decontextualization inherent in the process of identifying themes of scholarly practice. Participants were allowed to choose the working group in which they would participate, but the program staff strove to balance group membership, so that IT staff were not the only participants in *Shared Services*, librarians were not the only participants in the *Tools & Content Partners*, etc. Professional homogeneity within working groups would have made the discussions easier, but mixing up the membership was seen as a productive step toward developing a single community that bridged professional divides, with a shared vision informed by a diverse range of perspectives.

After workshop 2, working groups focused on specific needs, opportunities, and challenges for Bamboo in relation to their working group topic. Working group findings were presented and discussed at workshop 3¹¹ (12–14 January 2009), along with a straw proposal outline¹² and straw consortial model.¹³ The straw proposal outline introduced the idea that the Bamboo Implementation Project would be a 7–10 year endeavor that would need to be split into two phases. The straw proposal outline did not attempt to prioritize the foci of the different working groups, treating them all as part of the first phase (2010–2012). The resulting highly ambitious scope drew criticism from workshop attendees, who also noted the lack of specifics about

what exactly Bamboo would do, and the lack of defined criteria for success.¹⁴

At workshop 4 (16–18 April 2009), the Bamboo staff presented a more detailed articulation of a ‘Bamboo Program Document’,¹⁵ which outlined the 7–10 year vision and defined the activities to be carried out in the first development phase. The major activities for Bamboo were divided into three areas, with the first two major areas slated for implementation in the first phase¹⁶:

- (1) The Forum
 - (a) Scholarly Network
 - (b) Scholarly Narratives
 - (c) Recipes (workflows)
 - (d) Tools and Content Guide
 - (e) Other Educational and Curricular Materials
 - (f) Bamboo Community Environment(s)
- (2) The Cloud
 - (a) Services Atlas
 - (b) Bamboo Exchange
 - (c) Shared Services Lifecycle
 - (d) Tool and Application Alignment Partnerships
 - (e) Content Interoperability Partnerships
- (3) Bamboo Labs
 - (a) Diversity, Innovation, and Labs
 - (b) Ecosystem of Projects and Initiatives
 - (c) Structure (Explore, Plan, and Build)
 - (d) Liaisons
 - (e) Governance

While the workshop discussion draft of the program document had already benefited from two rounds of asynchronous feedback from participants, concerns remained about the lack of specificity in each of these areas.¹⁷ However, this did not hinder participants from expressing their enthusiasm for the areas of work proposed for the first phase of development. Grouped by institution, participants voted on each sub-area of the ‘Forum’ and the ‘Cloud’, to indicate interest (none/low/medium/high/potential leadership).¹⁸ Every topic except *Tools and Content Guide* had at least one potential leader, and *Content Interoperability (CI) Partnerships*, *Services Atlas*, and *Scholarly Network* all received a significant number of ‘high’ votes.

Workshop 5 (17–19 June 2009) featured presentations of demonstrator projects¹⁹ and discussions of the draft Bamboo Implementation Proposal²⁰ intended to be submitted to the Mellon Foundation that fall. The proposal, as discussed at the workshop, had the following major areas of work²¹:

- (1) Scholarly Networking—comprising the earlier *Scholarly Networking* and *Bamboo Exchange* from the program document.
- (2) Bamboo Atlas—comprising *Scholarly Narratives*, *Recipes (workflow)*, *Tool and Content Guide*, *Educational and Curricular Materials*, and *Services Atlas* from the program document.²²
- (3) Bamboo Services Platform—the major area of technical development for the project, comprising *Tool and Application Alignment Partnerships*, *CI Partnerships*, and *Shared Services Lifecycle* from the program document.

At workshop 5, the participants (comprising 43% arts and humanities faculty, 41% technologists, and 12% ‘content partners’, primarily librarians and archivists) were asked to vote (yes/no/abstain) on these areas of work. Participants overwhelmingly voted yes on all three,²³ while a handful of abstainers continued to voice strong concerns about scope,²⁴ particularly with regards to the Bamboo Atlas.

5 Bamboo implementation proposal

During the summer and fall of 2009, the Bamboo program staff engaged in an iterative feedback process with Chris Mackie from the Mellon Foundation on the proposal that developed out of workshop 5. The program staff intended to submit the proposal to the Mellon Foundation by the end of 2009, for consideration at the Mellon Board meeting in March 2010, with work beginning shortly thereafter. Instead, an organizational restructuring at the Mellon Foundation in December 2009 brought Bamboo proposal development to a halt. In this restructuring, the Mellon Foundation merged the RIT program that funded Bamboo into the

Scholarly Communication program, and the program officers with whom Bamboo had been working closely left the foundation.²⁵

Over the next 6 months, Bamboo program staff worked with Donald Waters and Helen Cullyer, the program officer and associate program officer in the Scholarly Communication program at the Mellon Foundation, on an implementation proposal for Bamboo that aligned with a different set of constraints and priorities than those provided by the former RIT program. The Mellon Foundation's earlier investment of \$1.3 million dollars in Bamboo's planning phase had left the project team anticipating a larger investment in the project's development. This proved not to be the case, and the pool of resources available to Bamboo contracted further in the wake of the global economic crisis, as IT and/or library groups at potential partner institutions faced steep cuts, leaving fewer staff, less cash, and a stronger mandate for directing what resources remained toward projects with immediate local impact, rather than contributing to a consortium in potentia with long-term potential. Scope reduction, which Bamboo had resisted, became unavoidable, and the priorities of the Scholarly Communication program shaped the outcome. Rather than reducing the scope of all areas of Bamboo equally, the 'Bamboo Commons' area (consisting of the earlier *Scholarly Networking*, *Scholarly Narratives*, *Recipes/workflow*, *Tool and Content Guide*, *Educational and Curricular Materials*, and *Service Atlas*) was eliminated almost entirely, with only a machine-oriented 'tool and service information registry' remaining. The resulting Bamboo implementation proposal more closely resembled the one suggested by the SOA-oriented planning project proposal than the document discussed at workshop 5. Even as the project's scope contracted through the elimination of almost all of the community-oriented aspects, it expanded in other ways. Two new areas of work that had previously received minimal attention were 'work spaces'—virtual research environments intended to provide basic content management capabilities and/or access to the tools on the services platform—and planning and design work for Corpora Space, 'applications that will allow scholars to work on

dispersed digital corpora using a broad range of powerful research tools and services' (Project Bamboo, 2010, p. 11). Corpora Space was to be built on top of the Bamboo infrastructure during a subsequent technical development phase.

In the Bamboo implementation proposal, UC Berkeley alone served as managing partner, with nine other universities contributing to the project: Australian National University, Indiana University, Northwestern, Tufts, University of Chicago, University of Illinois—Urbana-Champaign, University of Maryland, Oxford, and University of Wisconsin—Madison. The University of Chicago PI for the Bamboo Planning Proposal, vice president and CIO Greg Jackson, left that institution in August 2009, followed by Chad Kainz, Bamboo Planning Project co-director, a year later. None of the Chicago-based staff who were actively involved in the management of the planning process reprised those roles in the implementation phase. In addition, UC Berkeley hired a new project manager, and had to develop new relationships with staff at the Universities of Wisconsin and Maryland who took on areas of the project that Chicago had previously managed. These staffing changes led to a loss of the project's organizational memory, which had particularly negative consequences for the message and tone of the project's communication with scholarly communities.

6 Bamboo technology project

It remains difficult to articulate succinctly what Project Bamboo *was*, without either resorting to barely informative generalities ('humanities cyberinfrastructure, particularly for working with textual corpora') or a list of the areas of work. The project struggled to identify a coherent vision that neatly encapsulated all the work being done in the name of Bamboo, or to clearly describe what future state the work would collectively realize. The lack of a shared vision was compounded by the staffing model for the different areas. Most institutions focused on one area or subarea, giving them little exposure to the work going on elsewhere in the project. Unlike the planning project working groups,

where membership represented a mix of scholars, technologists, and librarians, the different areas of the Bamboo technology project were each staffed by the ‘usual suspects’—technologists focusing on shared services and work spaces, librarians focusing on interoperability, and scholars focusing on Corpora Space. This arrangement helped lead to a sense of mutual mistrust among the different groups²⁶—not atypical in project development,²⁷ but corrosive nonetheless.

Effective communication with scholarly and professional communities was never one of Project Bamboo’s greatest strengths. Even during the planning project, most activity took place on a public wiki whose complex organization was a barrier to access. The news feed on the project Web site had always been updated sporadically, but the complete lack of updates to the public Web site between August 2010 and April 2011—a period including the first 6 months of the 18 month technology project—fueled confusion and doubt about what, if anything, Bamboo was doing. Once periodic communication resumed in April 2011 with the launch of a new rebranded Web site, the lack of a clear shared vision became more apparent, as did the challenges of having such a widely distributed project team; some areas of the project received much more visibility than others. Outside observers’ combined uncertainty and lack of agreement about what Bamboo was doing were detrimental to the project’s reputation, to the point where it became a source of concern for the project staff and Mellon Foundation alike.

Nonetheless, a considerable amount of technical development and planning work took place under the auspices of the Bamboo Implementation Project between 2010 and 2012. Major accomplishments included the following:

- Investigation of HUBzero, Alfresco ECM, and the OpenSocial API as platforms for ‘work spaces’ or research environments for scholars³³ that could be integrated with the Bamboo Services Platform.
- Partnering with the long-running Digital Research Tools (DiRT) wiki to develop *Bamboo DiRT* (<http://dirt.projectbamboo.org>), which would serve as Bamboo’s ‘Shared Tools and Services Information Registry’.
- The Corpora Space design process, where humanities scholars and tool developers conceptualized a set of applications that would allow scholars to work on dispersed digital corpora using a broad range of powerful research tools and services.³⁴

- Development of identity and access management (IAM) services,²⁸ which also made possible account linking (e.g. of a user’s university and Google accounts).
- Development of a CI hub²⁹ that normalized texts using the *Bamboo Book Model*.³⁰
- Development of utility and scholarly services,³¹ and their deployment along with IAM services on a centrally hosted Bamboo Services Platform.³²

7 The end of Project Bamboo

Between December 2011 and December 2012, the UC Berkeley Bamboo program staff drafted two nearly complete proposals for a second development phase. The first, written in partnership with teams at the University of Wisconsin and the University of Maryland, directly followed from the Corpora Space planning process. The proposal was abandoned in June 2012, after it became clear that insufficient resources would be available. When the Mellon Foundation’s technical review of Bamboo emphasized Bamboo’s place as an infrastructure project (rather than an application development project), Berkeley started over on a new proposal in that spirit. The new version, developed with a team from Tufts, focused on extending the infrastructure and demonstrating its utility through a ‘Classical philology reference implementation’. On 13 December 2012, days before the anticipated final submission, the Mellon Foundation declined to move ahead with inviting the Bamboo proposal, citing the project’s track record of failing to define itself or achieve adoption for its code, the fact that it had not retained its partners, as well as dissatisfaction with the proposal itself. The Mellon Foundation requested that the team bring the project to a close, with an eye toward making the project’s legacy visible to and usable by others.

Between January and March 2013, the remaining Bamboo staff worked with partners to develop and publish a documentation wiki that would serve as a sort of ‘reliquary’ for the project, alongside the code repository, issue tracker, the archived Web site, email lists, and social media accounts. Respecting the Mellon Foundation’s preferences, the Bamboo staff never publicly announced that Bamboo was over. Word simply spread informally and unevenly³⁵ beyond the notification of project partners, until the day when the Web site was replaced by the reliquary.

8 Bamboo’s afterlife

Some of the components of Bamboo are still in use in other contexts.

8.1 Perseids

The Perseids project at the Perseus Digital Library (<http://www.perseus.tufts.edu/hopper/>) integrates a variety of open-source tools and services to provide a platform for collaborative editing and annotation of classical texts and related objects. An instance of the Bamboo Services Platform is deployed as part of Perseids to provide access to the Tufts Morphology and Annotation Services, and the supporting Cache and Notification Services developed at Berkeley. Under new funding from the Mellon Foundation, Perseids developers will be exploring approaches, including those offered by Bamboo IAM components, for enabling the platform to better support cross-project and cross-institution collaboration. In addition, the Perseus Digital Library is currently exploring the viability of the Bamboo IAM infrastructure to support a centralized user model for the Perseus ecosystem of distributed applications and services.

8.2 CIFER

Designs and technologies for account linking (part of Bamboo’s IAM work) have become the acknowledged basis of several items on the development roadmap for Community Identity Framework for Education and Research (CIFER, <http://www.ciferproject.org/>), a collaborative effort across a large

number of research institutions and consortia to provide an ‘agile, comprehensive, federation- and cloud-ready IAM solution suite’.

8.3 DiRT directory

In October 2013, the Mellon Foundation funded a proposal for additional work on Bamboo DiRT, which would be rebranded as the DiRT directory. This new project included the development of an API that will facilitate data sharing with other digital humanities directories and community sites, including DHCommons (<http://dhcommons.org>) and the Commons-In-A-Box (<http://commonsinaabox.org/>) platform, which powers sites such as the MLA Commons (<http://commons.mla.org/>). The DiRT directory continues to thrive as a community-driven project.

9 Conclusion

Project Bamboo began with the ambitious dream of advancing arts and humanities research through the development of shared technology services. Conscious of the challenges for humanities cyberinfrastructure identified in the 2006 *Our Cultural Commonwealth* report (Unsworth *et al.*, 2006) (e.g. ephemerality, copyright, and conservative academic culture), the Bamboo program staff identified those issues as out-of-scope for Bamboo after workshop 1,³⁶ but they continued to impact the project nonetheless (e.g. copyright as the fundamental motivating force behind IAM work).

Prior work on social science infrastructure development suggests that Bamboo’s mode of engagement—bringing together people from the scholarly, technology, and library communities after Bamboo had a conceptual and technical trajectory, while nonetheless expecting ‘participatory design’—would be a source of tension. Indeed, the wide range of responses to the initial technology-oriented proposal put Bamboo in a bind. Technologists and some librarians tended to see it as important and necessary, while many scholars felt that their needs lay elsewhere entirely. Changing scholars’ minds would not be quick; as noted in

Ribes and Baker (2007), ‘conceptual innovation is an extended process: one cannot simply make claims about the importance of . . . [e.g. cyberinfrastructure] and expect immediate meaningful community uptake’. Accommodating the interests of all three groups would necessarily mean a broader scope, but additional supporters could bring with them additional resources to make such a scope possible. It also seemed more promising than the alternative of creating a new group of like-minded technologists and librarians who would move forward with an SOA-focused development effort without focusing on scholarly outreach and adoption. In retrospect, doing so may have led the project to greater technical success, but it is arguable whether taking such an approach from the start was even a real option, given Bamboo’s public commitment to a ‘community design process’.

From the early planning workshops to the Mellon Foundation’s rejection of the project’s final proposal attempt, Bamboo was dogged by its reluctance and/or inability to concretely define itself. In the early days, avoiding a concrete definition was motivated by a desire for the project to remain flexible and responsive to its community. The tendency toward generality persisted long after it had ceased being adaptive, even after it became a source of criticism. An infrastructure project like Bamboo could be expected to name the tools and corpora it would integrate as a way to be more concrete, but it became apparent that very few of the tools in use by digital humanists at that time were being refactored to fit the model Bamboo was architected to support (i.e. scholarly web services running on nonprofessionally managed servers). If ‘true infrastructures only begin to form when locally constructed, centrally controlled systems are linked into networks and internetworks governed by distributed control and coordination processes’ (Edwards *et al.*, 2007), the shortage of locally constructed systems with wide scholarly uptake that were technically compatible with Bamboo was problematic.³⁷ The work done in the Bamboo technology project was pitched as laying the infrastructure for top-to-bottom support for working with textual corpora. Bamboo would support a complete

scholarly workflow, from accessing and ingesting texts from repositories, to analyzing and curating them using scholarly web services, all within an environment that facilitated collaboration. This vision was complicated by the decision to include integration with three different research environment systems, each with a distinct approach and feature set. This choice was partly pragmatic (allowing partners to focus on whatever platform their institution had already invested in³⁸), partly in keeping with Bamboo’s philosophy (the infrastructure was intended to be flexible, not tied to any one user-facing platform).

Flexibility and scalability were part of the early value proposition for Bamboo, and they remained influential considerations in the architecture and development of the infrastructure. However, the infrastructure was architected in such a way that made it difficult to complete and release stand-alone components that could be tested and used while other parts were incomplete. As a result, it was nearly impossible to create demonstrator projects that scholars or digital humanities developers could try out and that potential funders could evaluate. Demonstrator projects could have effectively and concretely shown that Bamboo was producing something useful, or provided an opportunity for feedback at a stage where it could have been incorporated productively. The technical team and the scholarly team had very different perspectives on what was needed, which led to frustration and communication failures from both sides. Consequently, the technical team relied on hypothetical scholarly use cases. Given the emphasis placed on the importance of communication between technical and nontechnical communication in literature on cyberinfrastructure development (e.g. Freeman, 2007), addressing this communication breakdown should have been a higher priority. The extensive development time required for infrastructure components, without opportunities to confirm that the components successfully fulfilled real needs, may have proven even more problematic had Bamboo continued.

The resources allocated to Bamboo were significantly smaller than amounts provided to similarly scoped infrastructure projects in the sciences.

Bamboo's struggle to produce value within these constraints was made more challenging by a failure to differentiate needs *essential* to the humanities, and those *unique* to the humanities. It is crucial in the long run for scholars to be able to work with texts in access-restricted repositories, but the prerequisite IAM infrastructure represents a common need across all universities. Seeing that existing consortia dedicated to working on this problem would not have a solution ready in time for Bamboo to adopt, it might have been wiser for Bamboo to re-define its initial scope to only include free-access textual repositories, allowing it to demonstrate success by sidestepping the encumbrance of copyright as identified by *Our Cultural Commonwealth*. While Bamboo's IAM work did make significant technical contributions, it came at the cost of diverting limited resources from other areas of the project, and became a 'reverse salient' (Edwards *et al.*, 2007) for the entire Bamboo infrastructure.

Deferring decision on Bamboo's sustainability plan and operational model until the second phase of development was consequential on multiple fronts. From a technical angle, it risked path dependency problems: the best technology choices for a centrally run enterprise-level platform may have made it considerably harder for individual universities to run the platform under a different model. From the social perspective, postponing decisions about what 'membership' would mean, how much it would cost, and what it would provide made it difficult for institutions to assess whether they would be 'winners' or 'losers' (Edwards *et al.*, 2007) if Bamboo succeeded. While Bamboo program staff saw Bamboo as freeing up local staff to provide more hands-on consulting about the application of scholarly tools (rather than spending time configuring and managing locally run tools and environments), some groups were concerned that university administration might see those staff as redundant in the face of Bamboo, and lay them off rather than transition them to new kinds of faculty support. Particularly for liberal arts colleges that had participated in the planning project, there was no way to engage with Bamboo to increase one's chances of ending up a 'winner', other than joining an occasional invite-only 'community'

conference call. Given the expansive scope of Bamboo's other deliverables, it was unrealistic for Bamboo program staff to have additionally taken on the work of establishing a sustainability plan during the first phase of technical development. Still, deferring or constraining the scope of some of the technical work (e.g. reducing the number of work space platforms) in order to redirect resources toward determining a viable operational and membership model before the second phase of development might have made more institutions willing to invest in Bamboo.

Perhaps, the greatest impediment to Bamboo's success was the lack of a shared vision among project leaders, development teams, and communications staff. In the beginning, Bamboo had multi-university cross-professional teams whose members faced challenges in communication and culture but helped one another understand Bamboo's goals in more nuanced ways. During the development phase, teams were formed on the basis of profession and institution, each one working according to their own status quo, with little connection to a bigger picture. The Bamboo planning project asked participants 'what's in it for you?'—an important consideration often overlooked in consortial efforts. Without a shared vision to counterbalance the pull of self-interest, a complex multi-faceted project like Bamboo becomes little more than a funding umbrella for individual initiatives. As the likelihood of those initiatives intersecting in a coherent way decreases, project messaging becomes muddled, and the resulting decrease in public confidence and comprehension can jeopardize a project's continued existence.

Brett Boley, director and CIO of the Office of Digital Humanities at the National Endowment for the Humanities, offered his own interpretation of and eulogy for Bamboo at *Digital Humanities 2013*, which may serve as a fitting conclusion here. He suggested that, if nothing else, Bamboo brought together scholars, librarians, and technologists at a crucial moment for the emergence of digital humanities. The conversations that ensued may not have been what the Bamboo program staff expected, but they led to relationships, ideas, and plans that have blossomed in the years that followed (e.g. DiRT and

the TAPAS project), even as Bamboo itself struggled to find a path forward.

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Notes

- 1 Despite later impressions to the contrary, early participation in Bamboo was open to any interested college or university (<http://web.archive.org/web/20080706131357/http://projectbamboo.org/colleges-universities>), museum or library (<http://web.archive.org/web/20080706131442/http://projectbamboo.org/museums-libraries>), or organization, society, or agency (<http://web.archive.org/web/20080706131346/http://projectbamboo.org/organizations-societies-agencies>) that could pay for their own travel and lodging. The university and library-oriented calls for participation mentioned the possibility of ‘limited travel support’ that could be arranged on a case-by-case basis; in practice, Bamboo covered lodging for participating teams during the nights of the workshops.
- 2 As of November 2013, archived versions of the Bamboo Planning Project wiki (<http://dx.doi.org/10.7928/H6RN35SK>) and Bamboo Technology Project wiki (<http://dx.doi.org/10.7928/H6MW2F28>) are hosted at UC Berkeley.
- 3 Project Bamboo was one of the first initiatives the author was involved in when employed by the Academic Technologies group of central IT at the University of Chicago, shortly after leaving a Ph.D. program in the humanities and while concurrently pursuing an MLIS degree. The author was a member of Bamboo’s core program staff throughout the planning process; while she was minimally engaged in the early stages of Bamboo’s implementation phase, by 2011 she was involved in both development and planning, and in 2012 she again joined the program staff at UC Berkeley, where she is still employed.
- 4 Later prose would reduce this number to three by collapsing the distinction between information scientists and librarians and eliminating computer science researchers. The latter group was barely represented in the attendees of workshop 1, let alone subsequent workshops.
- 5 One representative example, from a 2008 blog post entitled ‘Bamboozle’ (which also exemplifies the unfortunate wordplay on the project’s name that persisted throughout its duration):

...an interesting proposal to sort out What Needs To Be Done to aid scholars in using computational power and tools in their research. But there is very little evidence that they have done their homework to what efforts have gone into this before, and no mention of the digital humanities community/communities (such as Alliance of Digital Humanities Organizations (ADHO);

Association for Literary and Linguistic Computing (ALLC); Association for Computers and the Humanities (ACH); Society for Digital Humanities/Société pour l'étude des médias interactifs (SDH/SEMI); Text Encoding Initiative (TEI) and the hundreds of scholars already treading this path or trying to deal with the concerns raised in the proposal (Terras, 2008).

- 6 Scholarly practice as defined by Bamboo: 'For example, authoring might be considered a scholarly practice that is comprised of many component tasks; these tasks may include a literature review, documenting citations, acquiring peer review, etc.' (Project Bamboo, 2008, p. 27).
- 7 The stated goal of workshop 2 was to ratify the findings of a report on scholarly practice written based on feedback from the first workshop, and 'aggregate the initial list of component tasks required to complete these practices along with desired automation capabilities' (Project Bamboo, 2008, p. 29). As a requirement for attending the second workshop, each institution had to send 'at least one arts and humanities scholar and one enterprise-level technologist with, if possible, either serious interest in or experience with Services-Oriented Architecture (SOA)' (Project Bamboo, 2008, p. 28). In workshop 3, 'a professional SOA consultant will train participants to leverage our task lists by converting them to services. We will then attempt to describe scholarly practices as a sequence of identified service capabilities (in comparison, at the end of the previous workshop scholarly practices were described as a set of component tasks)' (Project Bamboo, 2008, p. 30). In workshop 4, participants would 'assign some type of initial grouping of scholarly practices, and prioritization as to the order in which services should be developed' (Project Bamboo, 2008, p. 31), and begin discussing organizational issues for a Bamboo consortium and requirements for being a partner institution in the next phase; these topics would also serve as the focus for the 5th and final workshop.
- 8 At workshops 1b (Chicago, 15–17 May), 1c (Paris, 9–10 June), and 1d (Princeton, 14–16 July), there were six exercises:

- (1) *Initial impressions*: What do you hope Bamboo will accomplish? What questions do you have regarding Bamboo? We are gathering together representatives from a range of backgrounds—scholars, libraries, IT staff, presses, and funding agencies—around the theme of how technology can better serve arts and humanities research. Based on what you have heard at the table and read from

the proposal, what one or two questions, observations, and hopes would your table like to share with the group?

- (2) *Exploring scholarly practice*: As a researcher, librarian, IT professional, computer scientists, etc., during a really good day, term, research cycle, etc. what productive things do you do in relation to humanities research?
- (3) *Common and uncommon*: What are common themes that have emerged from your exploration of scholarly practices? Based on your discussion of scholarly practices, what are two themes that piqued the curiosity of those at your table, or are uncommon? What makes these themes common and uncommon?
- (4) *Unpacking a commonality*: What discrete practices are involved in this theme? What outstanding issues need to be addressed in regards to this theme?
- (5) *Unpacking the uncommon*: For whom/which disciplines or areas of study is this theme helpful? What discrete practices are involved in this theme? What outstanding issues need to be addressed in regards to this theme?
- (6) *Identify future scholarly practices/magic wand*: When you look at new-hires or up-and-coming graduate students, what practices do they use that are different from yours? If you had a magic wand, what would make your day, term, research cycle, etc. more productive in relation to research?
- 9 See <http://dx.doi.org/10.7928/H6H41PBV> for a list of the themes that were identified.
- 10 Education (professional development of faculty and staff around digital tools and methodologies for teaching and research), Institutional Support (identifying service models and articulating the scope and value proposition of Bamboo), Scholarly Networking (evaluating existing social networking and Virtual Research Environment platforms for potential adoption by Bamboo), Shared Services (comprising much of the original SOA vision), and Tools & Content Partners (identifying models and standards for tool and content discovery and integration). See <http://dx.doi.org/10.7928/H6CC0XM4> for more information about working groups, and links to the wiki pages of individual working groups.
- 11 The agenda and notes for workshop 3 are available at <http://dx.doi.org/10.7928/H67P8W9K>.
- 12 Slides from the implementation proposal presentation and notes on the discussion that followed are available at <http://dx.doi.org/10.7928/H63X84K7>.

- 13 Slides from the consortial model presentation and notes on the discussion that followed are available at <http://dx.doi.org/10.7928/H6057CVT>.
- 14 These criticisms emerged in the discussion of the proposal: ‘Focused on value proposition; really needs to start saying what it is. Need to be more specific concrete things on the table. Lots of things involving text processing. For this to have clearly perceived value—need to start saying what those things are. Also some consensus that just from social perspective begins to be important to go back home after receiving funding to go to these things, “here’s what we’re going to do”’ (Table 10); ‘Finiteness of resources, and realities of what have to be accomplished. Have to tell stories about people who could put resources in. Need more finite sense of what is involved. A little concerned that we haven’t had that focusing-in phase.’ (Table 12); ‘Need to iterate - if Bamboo is ambitious, will fail over and over. Will succeed only if there’s a sustainability model that will allow for tweaking and redesigning’ (Table 13). See <http://dx.doi.org/10.7928/H63X84K7>.
- 15 All released versions of the Bamboo Program Document are available here: <http://dx.doi.org/10.7928/H6VD6WCJ>.
- 16 For full descriptions of each of these areas, see <http://dx.doi.org/10.7928/H6QN64N6>.
- 17 Notes are available on the discussions about the Forum (<http://dx.doi.org/10.7928/H6KW5CXG>), Cloud (<http://dx.doi.org/10.7928/H6G44N6G>), and Labs (<http://dx.doi.org/10.7928/H6BG2KW2>).
- 18 See <http://dx.doi.org/10.7928/H66Q1V5R> for full results and discussion notes.
- 19 Notes on these presentations are available at <http://dx.doi.org/10.7928/H62Z13FD>. A larger list of demonstrators is available in the Demonstrator Report: <http://dx.doi.org/10.7928/H6Z60KZ1>. Dombrowski and Denbo (2013) includes a discussion of some of the challenges that the ‘NYX/Barlach bibliography’ project encountered when attempting to demonstrate a service for processing TEI.
- 20 All versions of the draft implementation proposal are available at <http://dx.doi.org/10.7928/H6TD9V75>. Version 0.5 was discussed at workshop 5.
- 21 A more thorough description of the areas of work in version 0.5 of the draft Bamboo Implementation Proposal can be found here: <http://dx.doi.org/10.7928/H6PN93HT>. There was originally a fourth area of work, ‘Bamboo Community’—a repackaging of ‘Bamboo community environments’ from the program document. Participants largely agreed that this should not be treated as an area of work, but a component of the larger section on community and governance. As a result, this section was not put up for a vote.
- 22 In response to feedback from workshop 5, the *Scholarly Networking* area of work was merged with the *Bamboo Atlas*, and this combined entity was renamed the ‘Bamboo Commons’.
- 23 See <http://dx.doi.org/10.7928/H6JW8BS3> for full results.
- 24 ‘Direction of Bamboo Atlas is fine, but I have big reservations about the scope, both as it was described in original document and fear discussions haven’t narrowed scope at all’; ‘[W]hen you’re reading texts or doing markup, when you find a place that doesn’t make sense, it’s a place of interest but also a place where if you slice/dice differently, problem goes away. Atlas is a confusing chunk—what’s in it, what does it do, trying to tease it out, etc. Not clear exactly what the atlas does; pieces of it that one has associated with it are useful. Not trying to eliminate what it’s doing. But might make it cleaner to take pieces of Atlas (esp. ones that have to do with Bamboo users) and move to scholarly networking, and rename the whole thing.’ <http://dx.doi.org/10.7928/H6JW8BS3>
- 25 This was reported publicly in the *Chronicle of Higher Education*: <http://chronicle.com/blogs/wiredcampus/in-potential-blow-to-open-source-software-mellon-foundation-closes-grant-program/19519>. On 7 January, the following message was posted to the ‘News’ section of the Project Bamboo Web site:
- On 5 January 2010, the Chronicle of Higher Education published on its blog an article regarding recent changes at the Mellon Foundation and in particular, the closure of the RIT program. Although the planning project had been supported by RIT, the changes have had a minimal impact on Bamboo. At the end of December, both the University of California, Berkeley, and the University of Chicago were contacted by the Foundation, and Bamboo was smoothly migrated into the Scholarly Communications program. In short, the transition has gone well, and we look forward to working with Scholarly Communications into the future. (<http://web.archive.org/web/20101231171544/http://project-bamboo.org/news?page=2>)
- 26 This frequently manifested itself in the concern that the scholars would be unable to design sufficiently scalable applications, and that the technologists

- would spend inordinate amounts of resources on systems with minimal scholarly utility. These concerns were never raised through official channels, but had a real presence in informal conversations among members of each professional group.
- 27 This topic often arose over the course of the planning project workshops. Some examples: ‘sees huge gulf between librarians/faculty and technologists; so here is an opportunity to communicate with each other’ (Ex 1, 1b-B); ‘hope bamboo moves beyond the usual conversation between humanities scholars and digital technology, i.e. “What do you want?”, “What can you do?” Also troubled by formula of service, that digital technology folk and librarians are there just to “service” the humanities faculty; should be a partnership of equals, both have research goals they want to pursue’ (Ex 1, 1b-D); ‘Libraries, Publishing and Faculty are not talking. IT in the background. Efficiency and Effectiveness are not entirely a humanities priority.’ (Ex 1, 1b-E); ‘Humanities and IT people have different definitions of Effectiveness v Efficiency? Humanities has “productive inefficiency”’. (Ex 1, 1b-E) See <http://quinndombrowski.com/projects/project-bamboo/data/building-partnerships-between-it-professionals-and-humanists> for more quotes from the planning project workshops that refer to this phenomenon.
 - 28 For further information about Bamboo’s IAM work, see <http://dx.doi.org/10.7928/H6F769GD>.
 - 29 For more information about the architecture and implementation of the CI hub, see <http://dx.doi.org/10.7928/H69G5JRP>.
 - 30 See <http://dx.doi.org/10.7928/H65Q4T1C> for a description of the Bamboo Book Model, including its implementation through a CMIS binding. The Bamboo Book Model is also discussed in Dombrowski and Denbo (2013).
 - 31 See <http://dx.doi.org/10.7928/H61Z4291> for a list of service APIs that were developed by Bamboo.
 - 32 By proxying access through the Bamboo Services Platform, remotely running scholarly services could take advantage of IAM and utility services (e.g. result set caching and notification) hosted on the Platform. See <http://dx.doi.org/10.7928/H6X63JTN> for more about the architecture, development, and invocation of centrally hosted Bamboo services.
 - 33 See <http://dx.doi.org/10.7928/H6SF2T3B> for details about the type and extent of integration accomplished for each platform.
 - 34 See <http://dx.doi.org/10.7928/H6NP22C0> for information about the design process.
 - 35 During this transition period, the author received an email from a Bamboo planning project participant inquiring after upcoming opportunities for his liberal arts institution to become more involved. Even a few months after the Project Bamboo Web site was replaced, at *Digital Humanities 2013*, the author fielded multiple questions about the status of Bamboo.
 - 36 An ‘Advocacy’ working group was discussed at workshop 2 (<http://dx.doi.org/10.7928/H6RF5RZJ>), but participants were concerned that it failed to make a clear distinction between the self-promotion necessary for Bamboo’s adoption and advocacy with regards to larger issues facing digital humanities, such as those laid out in *Our Cultural Commonwealth*. Ultimately, a working group was not formed around this topic after workshop 2; the key issues for Bamboo in this area were reframed as ‘principles for leadership’, and explicitly put on hold (<http://dx.doi.org/10.7928/H6MS3QNJ>).
 - 37 The Bamboo program staff members were aware that a good deal of scholarly functionality was only available as desktop software (e.g. Juxta), or systems that required complex installation (e.g. Philologic), in 2008. They anticipated that software development in digital humanities would evolve toward a web services model, following trends in enterprise software development. Some tools have moved in this direction: Juxta released a web service in 2012 (<http://www.juxtaoftware.org/on-the-juxta-beta-release-and-taking-collation-online/>), and Philologic 4 includes web services (<http://dx.doi.org/10.7928/H6H12ZX4>). However, as of 2014, scholarly tools are still not expected to be delivered as web services, and a great deal of work is done using stand-alone web applications such as Voyant Tools (<http://voyant-tools.org/>), or locally run packages such as MALLETT (<http://mallet.cs.umass.edu/>).
 - 38 The modest duration of these institutional commitments came into conflict with the longer development, deployment, and support timelines for a large cyber-infrastructure initiative. While the level of Bamboo infrastructure integration for HubZero came closest to achieving the vision of the ‘work space’, by 2012, the University of Wisconsin, Madison, was moving away from supporting HubZero. Work was underway to port the integration code to Drupal—which had been selected as the ‘work space’ platform for the second phase of technical development—when Bamboo was shut down.