

Collaborative Tools Strategy

University of California, Berkeley

Findings

NOTE: This research was originally published in April 2008.

A number of key findings emerged from the interviews, roundtables, surveys and other interactions with campus people, across many departments and units and in many settings during late Fall 2007 and early 2008. These findings are presented below:

- Sections A and B provide an overview of the collaborative practices and tools currently on campus. (Section B, comprised largely of tables in landscape format, is provided as a separate document.)
- Section C discusses the common areas of need for collaborative tools on campus.
- Sections D, E, and F look at some of the alternative models available for providing collaborative tools, as well as the costs of providing selected tools.
- Section G looks at some of the policy and legal issues that would need to be considered with some of the newer models of service provision.

A. What are the primary contexts of collaboration on the campus, and how do people use tools to facilitate them?

Contents of this section

Some of the contexts in which people frequently collaborate on the UC Berkeley campus include:

1. Performing scholarly research
2. Teaching and learning in the classroom
3. Working with co-authors
4. Evaluating candidates
5. Working in service and project teams
6. Developing and maintaining relationships
7. Maintaining data
8. Communicating know-how
9. Navigating administrative processes (campus, systemwide and beyond)

This section describes these contexts, identifies some common practices people carry out within them, and gives examples of the tools — technological and otherwise — they use to facilitate working together in these settings.

1. Performing scholarly research

The Practice: Whether small or large in scale, or based on privately-collected data or public datasets, particularly in the sciences, collaboration has mostly supplanted individual research. In addition, affiliations with collaborative efforts – in cross-disciplinary groups and centers, across campuses, and even between institutions – are increasingly replacing departments as a primary locus of scholarship.

The Tasks: In its initial stages, the work consists of:

- Identifying primary and secondary resources
- Accessing, evaluating and managing existing literature and other prior knowledge
- Generating contracts and grant proposals to secure research funding (involving iterative cycles of planning, writing, and budgeting; aligning with campus procedures for sponsorship and accounting; gathering signatures; and submitting proposals and other documentation)
- Locating research subjects and others who can provide expertise
- Discovering field sites and archives
- Making arrangements for experiments, interviews, surveys, field studies and research trips
- Managing funds and compliance.

The actual "knowledge creation" involves gathering data, then transporting, storing, organizing, and analyzing it, much of which can require information technology services and support. Modern scientific research, for example, sometimes generates digital datasets that may range in size to terabytes or beyond, often requiring high capacity networks to transmit. (Data transport presents huge problems in the sciences; today, large sets of genomic data must still be exchanged by shipping hard drives by air.) Finally, the research is prepared for publication, dissemination, and peer review—processes that involve multiple parties, and almost exclusively, digital technologies.

The Techniques:

- Activating personal and professional networks (collaborative partners are most often someone known to the researcher)
- Reliance on word of mouth, and sometimes, serendipity—plain ol' luck
- Studying academic literature: reading journals, reviewing bibliographic citations and new articles (tables of contents and abstracts can now be sent automatically to your email inbox)
- Appointment making and travel planning
- Arranging access to data sources such as census records and genome sequences, and tools such as radio telescopes and survey instruments
- Designing and carrying out research protocols
- Managing data (a range of activities: see item A.7, below)
- Conceiving, authoring and otherwise interpreting research results for review by others
- Revision and promotion of the finished work.

Tools in Use Now/Shortcomings (if any):

- Phone and email: the standard means of communication on the UC Berkeley campus. Email is still king.
- Web sites: widely used for reference, but only as useful as the information on them is up-to-date and accurate. Keeping websites up to date is still a widespread and difficult problem.
- Reference librarians: Researchers on campus continue to consult with reference librarians. Increasingly, reference librarians work with remote patrons who are conducting research over the Internet, and sometimes use email and IM to correspond with patrons.
- Email mailing lists (listservs): a primary means of communicating timely and date-sensitive information within a field or subject area. (Mailing lists also provide a means to connect with professional networks more generally; see A6, below.)
- Journal subscriptions (paper and digital) and their associated services: fundamental, but increasingly expensive.
- Citation indexes.
- Citation management and note taking software: EndNote and other desktop applications are widely used, but not completely satisfactory. Zotero is an up-and-coming browser-based tool that, to date, works better for individual note-keeping than collaborative knowledge-sharing.
- Computer-assisted survey tools, still cameras and other image-capture devices, audio and video recorders, field measurement devices, remote sensors and data networks: the means of collecting data.
- Data sets and data bases: ranging from Excel spreadsheets and campus supported relational databases to Federal data sources and international, federated repositories.

- Analysis, visualization and presentation software, hardware and systems (examples of systems include Virtual Research Environments, grid computing and *SETI-at-home*-style distributed computing): very much linked to specific disciplines.

Additionally, of all the steps involved in generating and managing research funding, three in particular were noted by our respondents: signature-gathering, effort reporting and expense- and account balance-monitoring. The need to obtain ink ("wet") signatures rather than digital signatures—especially for forms that will eventually be submitted electronically under a digital signature—hinders the completion of the process and greatly frustrates staff. The newly-implemented electronic effort reporting system is seen by staff as a welcome example of a centralized process enabling a task that couldn't be performed otherwise, because the necessary data is not available at the departmental level; conversely, one Principal Investigator panned the new system as "Unbelievably complicated, for what is essentially a simple thing." Lastly, one PI stated a wish for a desktop (or browser-based) "dashboard" that displays the current status of funds for active projects, grants and contracts.

2. Teaching and learning in the classroom

The Practice: Traditional lecture and seminar practices remain popular at UC Berkeley, increasingly augmented by methods that focus on teaching students *how* to approach a subject rather than directly conveying particular subject matter. Group projects, performed in the classroom or lab or as homework, require students to work with one another. In this era of digital collaboration, the university community has at its disposal an ever-expanding array of tools to manage and enhance student participation.

The Tasks: Professors and instructors design the semester's curriculum, write and present lectures, and carry out a variety of instructional pedagogies. Additionally, they meet with students to clarify points made in class and to advise students on their assignments. The complexity of instruction increases for large lecture classes, in which teams of instructors, coordinators, lab preparers, technology providers and graders must align their efforts. In the largest of these classes, professors must work hard to engage their students. Finally, the end of semester brings student evaluations of their teachers, used in faculty merit and promotion cases and to advise future students shopping for courses.

The Techniques: Course descriptions and syllabi communicate to students a plan for the semester. Classroom communication includes lectures, discussions, videos, and presentations by students and outside guests. Lecture notes and PowerPoint slides, often posted online in advance of the class, give students the opportunity to preview, and review, the materials covered in class. Many courses, particularly large lectures, are webcast in audio or video form. Activity- and inquiry-based learning strategies include polling, demonstration, simulation and visualization. Homework assignments and exams provide additional opportunities for student work and assessment. Introductory science courses incorporate weekly GSI meetings to prepare labs and plan discussion sessions, and to allow faculty the opportunity to critique GSI teaching efforts.

Tools in Use Now/Shortcomings (if any):

- bSpace (Sakai): class sites include tools for teacher and students; over 1,400 courses currently have sites on bSpace. The bSpace platform, UC Berkeley's implementation of the community-source, university consortium-led Sakai project, is provided for free, and allows instructors and other campus users to create and administer their own sites. Its features include class lists, assignment tools, drop-boxes, quizzes, grade books, discussion forums, writing spaces, group sites, document storage, and several channels of communication. It is now the only campus-supported Course Management System, and has seen a phenomenal rate of adoption over the past two years. The campus's small bSpace development team, and the wider Sakai community, continually strive to increase performance and usability of the platform.
- Webcasting at Berkeley: the campus' Educational Technology Services broadcasts approximately 50 courses each semester, and provides an archive of webcasts for on-demand viewing. Apple's iTunes U and YouTube provide major outlets for widespread public access to these recordings. While the webcast system is well-designed and organized, the operational aspects of classroom recording sometimes place

additional burden on instructors as they prepare to begin class. Additionally, the impact of a course webcast on student attendance and participation is the subject of debate among faculty locally and education scholars nationally.

- Classroom podium-based electronics:
 - Microphones and digital projectors
 - Media players are available
 - Clickers, for in-class polling and response: these have entered some classrooms in the past few years
 - One faculty member rued the lack of a close-up digital video camera to project a detailed view of the demonstrations and experiments conducted during class.

(Note that issues of classroom technology have been addressed at other times by other groups across campus; a thorough review of classroom technology is not within the scope of this project.)

- Teacher evaluations: The existing practice of using paper-based evaluations completed by students in class at the end of each semester, though favored by many faculty, has cost departments tremendously. With the recent approval of the Academic Senate, student evaluations will be handled electronically.

3. Working with co-authors

The Practice: Collaborative authoring is a central undertaking in a campus environment, and one for which there is no universally embraced solution.

The Tasks: Whether collaborators are in neighboring offices or oceans apart, the need to produce content, comment on content produced by a co-author, incorporate changes, and respond to feedback, is pressing. Although this is not a complex interaction to understand, it appears to be a difficult one to solve well, as users seem generally dissatisfied with the tools available to accomplish this task. A recurring theme, repeated by users across campus: "I'm sure there's a better way to do this, but I don't know it."

The Techniques:

- Divide up the work by chapter or topic
- Assign one person as editor of the document, responsible for compiling the various changes and comments
- On large projects, assign 'chapter leads' to manage contributing authors
- Exchange subsequent drafts, often as attachments to email
- Employ an online document library. Some document storage tools allow authors to check-out documents for editing and check-in new versions with revisions. Other systems support simultaneous copies and maintain version controls to prevent changes from being overwritten and the resulting loss of data
- Use tools that facilitate simultaneous authoring. Recent technologies allow multiple authors to edit a single document, in place (online), at the same time.

Tools In Use Now/Shortcomings (if any):

Campus-supported

- MS Office: Currently, the tried and true "Track Changes" in Microsoft Word meets people's needs in those instances where there are only two authors, but many users express an inability to deal with the visual confusion introduced when more than two authors contribute changes. Version control becomes an issue, with users becoming confused as to which is the correct version of a document to edit. In order to cope with version issues, users often try to coordinate whose "turn" it is to edit a document, rather than attempt to merge changes from multiple documents together. Several people noted that the Track Changes feature is missing from PowerPoint, where it would be very helpful for lecture slides.

Third-Party

- Wikis: These online writing tools shine at capturing contributions from multiple authors, and are especially good for documents that don't require polished formatting. There are many types of wikis available; the markup associated with editing some of these proves to be intimidating to users who do not have a technical background. People have begun adopting wikis to create content that will eventually

become a finished document, but their divergent formatting leaves much manual, and cumbersome, editing to be done in transposing a wiki document to a finished word processing document.

- Google Docs: Some campus members have begun using Google Docs, an online editing tool that allows multiple users to edit the same document at the same time. Early adopters seem generally satisfied with the functionality offered by this technology, however the number of users across campus is comparatively low, especially among faculty and staff. This tool is also currently missing some critical features needed in an academic context, such as footnotes and endnotes.

4. Evaluating candidates

The Practice: Every single member of the campus community begins their relationship with the university as a candidate, whether that person is a student, a professor, a receptionist, or a dean. Additionally, each year hundreds of applications for prizes, awards, and partnerships are received. The process of evaluating candidates for admittance, employment, funding, or recognition is almost always a collaborative one, requiring coordination between multiple decision-makers and administrators.

The Tasks: Collaborators must screen applications for completeness, discuss relative merits of competing candidates, communicate with candidates, and eventually archive and store records related to the process. At every step, the process is further complicated by the need to maintain confidentiality of candidate submissions, demanding varying degrees of access to candidate packages.

Tools In Use Now/Shortcomings (if any):

Campus-supported

- Manual: In many departments, the tasks associated with evaluating a candidate are still handled manually through email, phone calls, and distributed paper copies of files (which must be retrieved and accounted for in order to maintain confidentiality). Face-to-face meetings are time-consuming and difficult to schedule.
- eRecruit: A component of the Human Resources Management System (HRMS) that manages the staff recruitment process at UC Berkeley. Among eRecruit's functions are processing job requisitions from departments and units, accepting résumés and applications for open positions and job pools from candidates, delivering applications to departments, managing interviews and offers, and communicating with applicants. eRecruit, like other HRMS and Berkeley Financial System (BFS) components, is based on Oracle/PeopleSoft technologies. All of these components have involved major changes in campus business processes, and have posed some occasional technological challenges related to issues such as performance and browser incompatibilities.

Third-party

- The "Recruiting, Cases and Awards" module of Our Unit. Our Unit is a suite of modules for performing many types of activities at the department or unit level, and includes features that can help manage selection processes, ranging from evaluating and ranking job candidates to making selections for awards. Architected and developed by Nancy Schimmelman, an IT Manager within the Department of Plant & Microbial Biology, Our Unit is an open secret in campus IT. Our Unit has been enthusiastically adopted by some 40 units on campus, despite not being officially supported as part of the broader campus infrastructure.

5. Working in service and project teams

The Practice: A large fraction of the work done at UC Berkeley is now done in teams. Research teams, staff members working together to provide ongoing services or conduct special projects, and students working in study groups or collaborating on course projects are only a few examples. Increasingly, these teams cross traditional boundaries, as in the case of research teams that span multiple academic departments and disciplines, and often

include external partners at other universities, and in industry, government, and non-profit organizations; and of teams of employees, who may be assembled from multiple units and assigned to tackle difficult problems, plan changes in strategic directions, or initiate new services.

The Tasks:

- Assembling and managing team members.
- Identifying and acquiring necessary resources.
- Coordinating schedules.
- Arranging for and managing all of the aspects of preparing for and conducting meetings, both face-to-face and remote.
- Developing goals, milestones, and task lists, and identifying task dependencies.
- Assigning tasks and tracking their progress, as well as progress toward milestone completion.
- Providing a repository for storing, finding, and retrieving communications and artifacts, such as group email, documents, and datasets.
- Facilitating collaborative work, such as group writing and editing of documents. In the sciences, this could even extend to 'virtual' experiments.

The Techniques: Team leaders and members often use a combination of multiple traditional tools, such as email mailing lists, a calendaring service, and a document repository, along with some form of a 'to do' list for assigning and tracking tasks and any other specialized tools required by the team's context, to compose a tool set that can be used by the team. In addition, they must also secure physical space for face-to-face meetings, and sometimes make arrangements for voice or web conferencing to include remote members in meetings. Typically prior to the first meeting, and if not by then, nearly always by the end of that meeting, the team will have chosen or nominated a set of tools, practices, and conventions for carrying out collaborative work. In recent years, with the advent of the campus's CalShare and bSpace services, a team may also select one of those team collaboration environments to set up an online team workspace. Those environments are often used primarily as a document repository, but sometimes teams may also use some of the other tools they offer, such as discussion forums or wikis.

When an ad hoc group, such as a student study or project group, has a very short timetable for completing their work and limited access to or investment in tools provided by the university, they often look for 'least common denominator' tools that can be up and running within minutes, picking and choosing from offerings from the university and outside service providers. For instance, if the group finds that nearly all of its members have Google/Gmail accounts, they may start out by setting up a group calendar on Google Calendar.

Our research has identified that the choice of tools is frequently driven by the past experience of the team lead, or of influential team members; if they've led or participated in a team that used a particular set of tools with some success, they often introduce them within their next team setting. This can have the drawback of requiring other team members to learn new tools with each new team or project context.

Tools In Use Now/Shortcomings (if any):

Campus-supported

- CalMail mailing lists for group communications. CalMail currently doesn't provide any integral way of archiving and browsing or searching past communications among team members.
- CalAgenda for shared calendaring and scheduling of resources, such as meeting rooms. CalAgenda reaches approximately 5,000 campus staff and faculty, but the vast majority of the campus, including nearly all students, do not have access to this service, which is currently offered on a recharge basis. CalAgenda's own 'to do' list functionality is also very limited, and this service doesn't integrate easily with other task assignment and tracking tools, or with other calendaring and scheduling projects.
- CalShare, a team collaboration environment based on Microsoft SharePoint. CalShare offers a rich set of tools for team collaboration, but at the expense of considerable complexity, both with respect to administering and setting up new worksites and training new users. It can also be somewhat involved to allow non-campus members to participate in worksites. CalShare is offered to the campus on a recharge basis, and the cost to set up a CalShare site can be prohibitive for some casual and ad hoc teams.

- bSpace, a team collaboration and learning environment (CLE) based on Sakai, an open-source software framework. While bSpace's primary mission is to facilitate learning, particularly through formal course sites, it also offers team workspace capabilities. bSpace is free for use by campus affiliates, a new worksite can be set up in minutes, and it is relatively easy to invite non-campus members to participate. However, the capabilities of some of its tools are quite limited, and it lacks some core project-oriented functionality, such as the ability to assign and track tasks, and to measure progress toward milestones and goals.
- Microsoft Office, particularly Microsoft Word and Excel. These applications are often pressed into duty for a myriad of functions for which they are not intrinsically suited, such as maintaining task lists.
- Microsoft Project, for managing resources, tasks, milestones, and the dependencies between these, and for tracking project progress. This tool is powerful but is widely viewed as exceedingly complex, with a steep learning curve. When used as a desktop product (i.e. when not used in a server context), it can be difficult to allow more than one person to collaborate in managing a project.

Third-party

- Basecamp, a team collaboration environment hosted by 37signals. Focused on making it easy for independent contractors and self-employed professionals to work with clients and partners, its ease of use and low cost has appeal for ad hoc teams, but its functionality is limited.

Related research

In 2006-07, two successive cross-department teams within IST conducted ethnographic and technical research into how teams within that organization collaborated. This research examined their practices and needs and identified how tools, particularly team collaboration environments such as CalShare and bSpace, could be used to meet those needs. Although technology-focused departments such as IST are different in some respects from other campus units, this research captures many aspects of how teams work together and how specific tools and tool suites may be applicable to their needs, and may be broadly applicable to many campus contexts. You can find this research via the links to the "Phase I Report" and "Phase IIA Report" on the IST Collaborative Tools project page at <http://collab.berkeley.edu/projects/istct/>.

6. Developing and maintaining relationships

The Practice: Members of campus invest a great deal of resources into building relationships with peers, community partners, alumni, prospective students, academic colleagues and industry partners. These relationships are essential to the continued growth, vitality and efficiency of the community. Personal and organizational networks enable us to complete work assignments and to navigate administrative processes; to keep up with innovation in our fields and to advance in our careers; and to effectively respond to our customers and to the public.

Techniques: Personal communications become established and augmented through common projects and workplace favors (see item A.8, below). The Rolodex, or more likely, its younger cousin, the computer-based address book, speeds addressing and still provides the "juice" to locate just the right person or resource. Web searches, however, have become a powerful way to find who and what you need to complete a task. Meetings, often seen as the bane of campus work life, provide opportunities to meet colleagues and to learn the lay of the land. Organizationally, departments and programs develop and maintain these bonds through events such as speaker series; workshops, conferences and institutes; and socials. At a greater scale, outreach and education occurs through program newsletters, email mailings, web sites, and video (we're beginning to see blogs, and podcasts, such as the *Greater Good Science* site). The variety of channels means that names and addresses of partners and participants become dispersed across multiple contact, address, mailing and membership lists.

Tools in Use Now/Shortcomings:

Campus-supported

- Excel: though not "supported" for this purpose, Excel is a familiar offering which many users press into service to keep track of contacts and the details about those contacts, despite the fact that it lacks features specifically for relationship management and is not collaboration-friendly.

- CADS: Built primarily for tracking donations from alumni and corporate sponsors, CADS does not currently offer the advanced, easy to use features and functionality of modern web-based tools.
- Issue tracking: e.g., Remedy, Footprints
- Email mailing lists (listservs): a primary means of updating group members, and of addressing user and participant questions and concerns. The campus has established a series of role-based groups, such as Deans and Directors, All Faculty, and All Staff, but lacks effective tools for dynamically identifying members of other than these groupings. Several examples arose in the discussions held as part this research, including:
 - There is no direct way to send an email to all staff within the PSS 5 and above grade classifications
 - Pinpointing all instructors, of various rank and tenure, was impossible prior to a three-year effort to develop a list that targets All Instructional Titles
 - A practice common to community and educational partnership programs (if not more widespread) is to maintain two separate lists for administrators (related to funding, program design, etc.) and for the end-user community. This latter is a catch-all list containing the names of all who have participated (whether frequently or only once), expressed interest, or otherwise come to the attention of the program staff in any context. The time and effort it would take staff to research, implement and maintain more targeted and effective lists of sub-groups within the end-user community poses a barrier to adoption for those organizations.

Third-party

- Constant Contact: an email service that manages addresses and provides data on opened mailings, forwarded messages, and inactive accounts.
- Salesforce.com: this well-known Customer Relationship Management software is put to use by a number of campus organizations, with no coordination of expertise, licensing, or oversight. At least one user also found it difficult to delegate access to certain capabilities but not others.
- Social networking sites, such as Facebook, MySpace and LinkedIn: These 'Web 2.0' tools have pioneered 21st century ways of being seen and staying connected. They present the largest-scale means of relationship management. Our research did not systematically investigate the adoption and use of these tools (a valuable subject for follow-up investigations, perhaps), and we heard mention of these tools from only a few of our respondents. Still, we presume that they are in use by a great number of students and a growing proportion of the other sectors of the campus community.

7. Maintaining data

The Practice: The ability to find information on a given topic of interest is an essential skill. However, we are faced with mountains of data that must be sifted through until only the most relevant results remain. Even when we aren't actively searching, we are inundated by information that must be prioritized: emails, websites, rss feeds, saved searches, departmental mailers, all compete for the busy person's limited attention. Who wrote that piece about protein receptors in the brain? Where did I see that notice about the parking lot closing early? We are all our own librarians, responsible for discovering, filtering, organizing, and archiving our private stores of knowledge.

Research data comprises another facet of this challenge; qualitative and quantitative results each require different procedures in order to be made available for analysis and review by the investigators themselves, and by their research partners and colleagues. Very rarely does one person carry out every aspect of this process. Administrative assignments, too, produce documents and other information that are valuable not only for the discrete task at hand but for other needs as well, now and in the future. (Item A.8, below, addresses 'Communicating know-how,' which often involves passing along data as well as expertise.) With all types of data, the campus community faces the question of "How do we maintain accessibility of files in older, no longer supported formats?"

From the organizational perspective, the value of this intense labor becomes enhanced when other people and units can take advantage of our winnowing and management processes. Often, there is no competitive disadvantage to making both our practices and the results of our practices available broadly to campus. On the contrary, sharing

experiences and expertise can lead to efficiencies in our business processes, in our use of tools, even in our licensing expenses. (Again, see item A.8, below.)

Few of us have a dedicated support specialist available to help us manage our data. Rather than a person on payroll, we must turn to a diaphanous support network, cumulatively capable of managing the volumes of information. The work can not be accomplished except through collaboration.

The Tasks:

- Discovering resources and expertise, handling information overload, 'keeping found things found'
- Record-keeping to support student, employee, and research needs (enrollment and registration, human resource management, contract and grant administration); financial accounting
- Providing access, while managing confidentiality
- Collecting, integrating, archiving, analyzing and presenting research data. (See also item A.1, above.)

The Techniques:

- Word of mouth (with respect to discovery of ideas and sources; see also item A.6, above): through direct conversations and correspondence, as well as in meetings, symposia, conferences, committees
- Using email as a personal data store. This idea was expressed most fully by one staff member who said:

My email is organized by folder. The documents [are stored] on a secondary level, related to emails. So, when I look at it that way, how much email is at the center of everything ... I honestly can say there's very little I touch that doesn't involve another person, or usually multiple people ... [My work] is totally collaborative.

- Search (in libraries and online)
- Data creation or collection; editing and clean-up; filing; accession and archiving of originals, production of back-up and viewing copies (museum and library collections)
- Digital file back-up
- Indexing, bookmarking, flagging
- Sharing files and documents
- Email alerts and filtering, subscription to RSS feeds
- Creation of storage, workspaces, and work groups: both 'real-world' and online
- Data analysis, visualization and presentation

Tools In Use Now/Shortcomings (if any):

Campus-supported

- Email, attached documents, mailbox search: these personal approaches can be simplest and most productive from an individual's perspective, but inefficient overall in terms of use of storage, redundant copies (which is the most recent one?), and inaccessibility by others. Additionally, large attachments can have problems in transit.
- Departmental file shares and shared drives
- Personal, unit, and departmental websites: valuable, but still difficult to keep current and accurate
- WebFiles: expensive for campus to maintain; duplicative, in some ways, of other campus services
- Collaboration tool suites and platforms, such as bSpace (Sakai) and CalShare (Microsoft SharePoint)
- Collection management tools: various ones are used by the museums and libraries on campus
- Research data tools: Aside from the common productivity tools, these vary by discipline and subject area

Third-party

- Databases from various vendors
- Web-based groups such as Google Sites and Yahoo! Groups
- Social bookmarking sites such as del.icio.us
- Social networking sites such as Facebook and LinkedIn (useful for discovering and locating sources and expertise; see also item A.6, above)

- Various subject-area and collection specific tools

8. Communicating know-how

The Practice: Making job-related expertise discoverable, accessible and usable by colleagues (current and future). Formal programs address aspects of this need, but much of it occurs on the fly, passed along by a helpful colleague, in response to an often-times 'need-to-know-now' query. The proliferation of workplace technologies has only amplified this need. (Think: "How do I get this %#@! copier to work?") The effort spent investigating how to carry out the work at hand greatly contributes to the frustration of campus members of all stripe. From the perspective of the campus, enabling individuals in far-flung departments to take advantage of the knowledge, contacts, and licenses engineered by campus community members increases efficiency. Moreover, the campus stands to lose volumes of knowledge and expertise over the next few years in the coming wave of Faculty and Staff retirement.

The Tasks:

- Passing scholarly and workplace expertise to colleagues
- Building institutional knowledge, tapping and codifying tacit knowledge, documenting processes and decisions for others who come later
- Support & training (giving and receiving)
- Technology support, guidance and self-help assistance

The Techniques: The Center for Workforce Development, Information Services & Technology, the Library, and many other campus units offer classes and trainings on a range of topics and systems. Additional training occurs off-site, in workshops and conferences. Some campus support providers, such as administrative and departmental computing services and the Cal 1 Card, offer help desks and other forms of customer service. In the technical fields, especially, service organizations provide expertise and answers through FAQs and knowledge bases.

More often, workplace and academic know-how is communicated in an ad-hoc or word-of-mouth manner. Our Unit, used in part for evaluating candidates, and Salesforce.com, for contact management, are two examples of beneficial tools that received frequent mention in our research; both cases attest to the informal nature of discovery and adoption on campus. Email mailing lists—listservs—play a big role in supporting the spread of knowledge across the campus community. (Subscription offerings range from Micronet to Teach-net to the Berkeley Parents Network.) On this score, on this campus, experience counts!

Most apparent, from our research, is the perceived lack of sufficiently designed and coordinated processes and tools for sharing information. The implications of this touch all of campus. Three striking examples: the difficulty faced by a student trying to ascertain the steps required to fulfill his PhD requirements (see item A.9, below); the hole created in a lab's web presence when the one web-savvy graduate student moved off into the next phase of her career; and the disruption within the Disabled Students Program upon the death of a key staffperson. Without articulated practices and centrally-supported methods in place, we each become the repository of our accumulated know-how. As people come and go—through triumph, tragedy, or the normal course of business—valuable knowledge often gets lost.

Tools in Use Now/Shortcomings (if any):

- Formal training programs and workshops: too much of this training, according to our interviews and roundtable discussions, emphasizes learning to use a computer-based application or system, and not enough focuses on the underlying business processes. Beyond that, training sessions on technologies such as bSpace and CalAgenda help those who attend, but don't reach the many members of campus too busy or unwilling to participate.
- Intranet sites, especially in units with large student employee populations that turn over quickly
- Issue tracking tools, such as Remedy and Footprints, support customer service
- Knowledge Bases, like IST's Knowledge Base

- RSS feeds: like listservs, feeds allow campus members to stay abreast of recent events and trends in their field(s) of interest

9. Navigating administrative processes (campus, systemwide and beyond)

The Practice: Perhaps it's easy to kvetch about bureaucracy, but this subject came up in our earliest interviews and echoed through much of the research. Processes that are difficult to comprehend or complete lead to waste and anger. Yet, they can also provoke good, innovative thinking.

Technology has both enhanced and complicated campus business processes. Many administrative tasks can now be completed quickly and efficiently online. Centralized network-based systems have (at their best) "flattened out" unproductive variation in policies and procedures across departments. However, poorly thought-out technological overlays on existing processes can carry forth and exacerbate weaknesses in the original (analog) design. Furthermore, in some cases, there is much value in the flexibility afforded by local control of resources.

In the case of document submission and signature gathering, the transition from paper-based to electronic methods has been uneven and unfinished. It has neither completely kept up with changing practices, nor provided the benefits that technology can offer. As we heard from a group of academic business officers:

I don't understand why on campus they're still requiring a paper copy, before they even look at it; they won't even review it for you until you send them a paper copy.

[An] enormous amount of time [is] spent walking around campus [looking for a PI signature] in an environment when nobody works that way anymore. ... 70% of time, the PI is not on campus.

[There's] no reason on earth we should have to walk down to the Power Bar Bldg [to deliver paper].

Major funding agencies do it online: [look at] Fastlane.

In some campus business areas, the user experience has not been well-designed. Additionally, with the increased reliance on computer systems, training in underlying processes has diminished (see item A.8, above). Sometimes this results in improper practices; at others, especially when pieces of the process have been distributed across systems, the inability to resolve issues.

Digital systems can also engender problems not faced in an analog world. (There are many new wrinkles to the issues of data governance, format, and privacy, for example.) They can change the expectations of users, add to the demands on campus departments and units, and ultimately, alter the roles of service provider and customer:

The BFS introduction changed the way people interacted with one another. Prior [to BFS], the view of central units vs the local academic units was like the mother bird feeding the babies: a one-way stream [of] dissemination. ... [W]e down here were to receive what was dropped down from on high. With a business system done electronically, that doesn't work, because the users at both ends have to communicate.

- Academic business officer

Negotiating administrative systems to carry out campus business requires not just expertise with the matter at hand, but also familiarity with the processes. Faculty, staff and students alike (and probably outside vendors and

contractors, though we did not talk to them) look for advice from others who have gone through the process before. They must go to great effort to teach themselves the requirements and the necessary steps:

There's a lot of that at Berkeley, a lot of figuring out what you're supposed to be doing that at other institutions I've been a part of [has] been more smooth. ... You have to develop proactive strategies for dealing with it.

- Graduate student

Providers, as well as users, need access to effective support, characterized by one academic officer as "bootcamp training ... instead of obsolete web pages that present out-dated and incorrect instructions." Luckily, the campus attracts resourceful faculty, students, and staff—a community with plenty of initiative. There is, however, much that it can do to help them:

All of us as managers, and the staff that work for us—and the faculty that rely on us—if there's a tool out there, we're going to find it and use it. But it makes the best systems work when the campus offers it.

- Academic business officer

The Tasks:

- Numerous daily activities, of which a few examples are:
 - Managing HR, payroll, and purchasing
 - Contracts & grants administration
 - Matriculation, course registration, declaring and changing majors and programs, and completing degree requirements
 - Scheduling rooms and otherwise arranging for the use of various campus spaces
 - Procuring classroom maintenance
- Submission of documents, both in paper or digital form, and the concomitant signature gathering
- Filling out redundant paperwork, and entering data in multiple places
- Working between numerous campus and departmental administrative systems, e.g. BLU, HRMS and departmental intranets
- Data gathering and reporting to parent organizations, such as home departments, the campus, UCOP, and to outside agencies
- Imaging documents into PDF or other electronic format

The Techniques:

- Web research
- Inquiries by phone and in-person
- Finding others to serve as guides
- Acquiring data held in various systems
- Cutting and pasting text between disparate tools

Tools in Use Now/Shortcomings (if any):

- Multiple systems and tools, including HRMS, BFS/BAIRS, PARS/ERS, TeleBEARS
- Many legacy paper-based processes

B. What collaborative tools are campus IT providers currently providing or using?

In addition to talking with campus users of technology, we talked during Fall 2007 and early 2008 with providers of this technology about the tools they provided and their future plans. These findings complement the user discussions but introduce a different level of detail.

This data is presented as a set of tables in a separate document:

What are campus IT providers currently doing with collaborative tools?

http://collab.berkeley.edu/projects/cctsd/cctsd-research_findings_section_b.pdf

C. What are key campus needs?

Contents of this section

As we analyzed the above research, the needs for better support of collaborative work clustered into several areas that appeared across multiple contexts of collaboration. This initial analysis, shaped by feedback from reviewers on- and off-campus, formed the basis for the final Strategy.

The areas of need identified by this research were:

1. Support communities of practice
2. Make workflows work
3. Track and coordinate contacts and relationships
4. Capture knowledge and make it accessible
5. Facilitate creating content together
6. Provide 'lightweight' tools for managing projects

In addition to the emerging categories of campus needs identified above, there are many current campus IT services that enable people to collaborate on a day-to-day basis. A related finding is that the customers of these services would greatly benefit if the Berkeley campus were to:

7. Make selected improvements to infrastructure and existing services

Finally, our research surfaced a category of campus need, also highly related to collaboration, that fell somewhat outside the technological focus of this IT strategy document:

8. Provide adequate physical space for face to face meeting (spaces that can be easily reserved and are equipped with simple tools for collaboration, network connections, and power outlets)

1. Support communities of practice

In the introduction to this strategy document, we talk about the university as a community of communities. Some of these communities are formal and, with only minor exceptions, their members are easily identifiable:

- All of the faculty with full or shared appointments in the College of Natural Resources
- All of the current English majors
- All of the people that graduated with a Bachelor of Science in Nuclear Engineering in 2003
- All of the employees with a job title in the Laboratory Assistant series.

In contrast, other communities on the UC Berkeley campus are "communities of practice." In the [words of Etienne Wenger](http://www.co-i-l.com/coil/knowledge-garden/cop/lss.shtml) (<http://www.co-i-l.com/coil/knowledge-garden/cop/lss.shtml>), these are "communities created over time by the sustained pursuit of a shared enterprise." Communities of practice emphasize "the learning that people have done together rather than the unit they report to, the project they are working on, or the people they know."

There are communities of practice woven throughout all areas of the campus community. Communities of practice are usually more meaningful in day-to-day campus life than formal communities, and are the means through which a significant portion of the work central to the campus's mission is conducted. Some specific examples:

- *Everyone involved in providing direct services to prospective and current graduate students.* Many different people are involved in recruiting promising graduate students, arranging for their financial support, helping ensure that they have access to appropriate research and teaching opportunities, and

monitoring their progress toward graduate degrees. This community of practice not only includes the staff of the Graduate Division, but also numerous campus staff members working, at least in part, in "graduate assistant" or "graduate advisor" roles. Those staff work in many different campus departments, and may have any number of different formal job titles.

- *Everyone related to the UC Berkeley campus who is working on the commercialization of liquid biofuels.* Biofuels are made by converting corn, switchgrass, sugar cane and beets, algae and similar renewable crops into substitutes for petroleum-based fuels, such as gasoline and diesel fuel. Members of this community of practice include faculty, researchers, graduate students, selected undergrads, and others spanning a number of disparate departments and units in the physical and biological sciences. This community also includes other members whose participation may not be obvious at first glance, such as people affiliated with the Haas School of Business who specialize in industry analysis or financing for these types of enterprises, and agricultural and earth scientists who can contribute their understanding of the solar radiation, soil, fertilizer, and water resources required to mass-produce specific biofuel crops, as well as the ecological impacts of doing so.

More generally, communities of practice often form around groups such as:

- Teams of instructors and teaching assistants engaged in teaching large courses
- Organizations of campus business officers
- Groups working in partnership with, or doing outreach to, various community organizations
- User groups for various computing technologies
- Members of a research lab associated with one or more principal investigators

Building and maintaining communities of practice is often quite difficult, for several reasons:

- *Discovering communities is hard.* For new members of the campus community - such as newly arrived students, and newly hired faculty and staff - it's often quite difficult to discover and join relevant communities of practice. Frequently, such discovery happens by chance, through peer contact over time. For many, we found that this can even be an anxiety-ridden process.
- *Discovering members is hard.* It is often hard for the maintainers of a community of practice to find and contact potential members of their community. In the academic context, collaborators for research are generally discovered through personal connections (one's former students, or their students, or the researchers one meets at conferences). This creates particular difficulties for interdisciplinary research, as there tend to be fewer personal connections across disciplines, and therefore many fewer ways to discover potential collaborators.
- *Keeping track of members is hard.* The contact information for members of a community of practice often changes. It is difficult to keep the information about each member current, especially for members of the community that are not, or are no longer, on campus (e.g. alumni or professors that have moved to other universities). Even with people who are on campus and in the CalNet Directory, their email or physical addresses are often not kept updated in various campus and departmental lists when they change their address in the CalNet Directory. This especially affects outreach activities, including alumni relations, community outreach (e.g., Bay Area Writers Project), student recruitment, etc.
- *Communities often extend beyond the borders of campus.* In many contexts, communities of practice include people that are not members of the UC Berkeley campus community. For example, research often involves collaborators from several different universities, foundations, and governmental entities. It can be time consuming to acquire contact information for these off-campus people, and challenging to keep that information up to date.
- *Facilitating community interaction is hard.* Without regular interaction among members, it is hard to sustain and maintain communities. Communities of Practice need spaces within which they can

collaborate, share data, and maintain common knowledge. Currently, most communities of practice rely on email, telephony, and face to face contact. These methods of carrying out conversations have inherent limitations, such as not being readily sharable with other members of the community who did not participate. bSpace project sites offer some of this functionality, but the suitability of bSpace or any other campus-provided tool for facilitating community interaction has not been closely examined, nor has this use been funded for full support within bSpace.

- *Preserving community knowledge is hard.* Communities of practice are all about shared learning. When communities can share best practices and hard-won experiences from past mistakes, they can be tremendously effective. However, finding ways of preserving that knowledge for future use - when long-standing members leave or memories fade - as well as making that body of knowledge available immediately to new members of the community, can be challenging. (For a further discussion of this topic, please see item C.4, "Capture knowledge and make it accessible," below.)

2. Make workflows work

A "workflow" is a repeatable campus business process that incorporates multiple tasks, each of which may be assigned to a different person or group. Certain tasks may also be automated, under the control of a set of business rules. The work "flows" from one state to another, until any of a number of end states is reached.

A large amount of the work that takes place on campus is workflow-based. Some examples:

Research processes:

- Submitting proposals for research sponsorship, such as applying for contracts and grants
- Submitting and reviewing papers for publication

In addition to these management and administration-oriented processes, workflows related to experimental research are starting to be explicitly identified and shared within the sciences, as evidenced by the [MyExperiment project](http://www.myexperiment.org) (<http://www.myexperiment.org>).

Administrative processes:

- Processing purchase requests
- Reviewing and selecting candidates for jobs
- Performing degree checks

Building and sharing workflows is often quite difficult, for several reasons:

- *Workflows are frequently custom-built using different tools, technologies, and approaches.* Typically, each campus workflow is designed and managed independently from all the rest. If all or a portion of the workflow is completed online, it is usually completed in a custom application developed for that particular workflow in that particular department. There is little sharing across campus departments of workflow tools or workflow designs. Similarly, there is little sharing of online, interactive workflow applications that can be used either 'as is', or with minor adaptation, for commonly-encountered purposes. This custom-built approach makes updating or creating new workflows difficult and expensive; it also makes it difficult or impossible to share workflows across departments, and to build campus expertise in, and support for, a common set of tools and techniques.
- *Business process expertise is not yet widely available on campus.* Some departments do not have access to employees with the necessary skill, experience or time to analyze current business processes and determine whether, or how, to carry out the translation from paper to online processes. As a result, when

workflows are updated or transitioned to new technologies, there is frequently little if any business process analysis performed. This can result in simple online analogs of an outdated paper-based process, with little thought given to whether the business needs for the process are still current and valid; whether the process can be modified to be made more efficient in its operation; or whether it can be made more beneficial to internal or external customers.

- *Some online workflows are hampered by requirements for paper at certain stages.* Workflows that could otherwise be completely computer-based are also often hampered by paper-based requirements related to approval, tracking, or record keeping (auditing). This is because tools, infrastructure, or legal or policy requirements haven't yet caught up to the opportunities presented by online workflows.

3. Track and coordinate contacts and relationships

The most fundamental relationship that an organization has is with its customers. This refers to the relationship that the university and its units have with members of the public, students, alumni, etc., as well as to the many customer relationships and interactions within the university itself. In any given week, most members of the university community are often both customers of and service providers to numerous other units on campus.

There are three key campus needs associated with strengthening this core relationship:

- a. Track and coordinate the contacts that the campus and its units have with their customers
- b. Create and maintain customer relationship profiles, identifying the many contexts in which any particular customer is related to the campus and any of its units
- c. Unlock the data needed to conduct effective outreach efforts, to engage customers in working with the campus

a. *Track and coordinate contacts.* Tracking and coordinating interactions with customers provides us with the opportunity to significantly improve the service we provide to our customers. To paraphrase a quote from a Wikipedia article, by making it possible to better coordinate the efforts of different members of the campus community, we can better create "an overall valuable series of experiences, products and services for the customer."

Have you ever had the experience of talking to two or more people at various campus offices or help desks, each of whom ask you the same set of questions? Have you ever received advice that contradicts what you heard from the last person you talked with?

From the service provider's standpoint, tracking and coordinating interactions from customers can help avoid those situations. By doing so, we can help ensure we:

- Have meaningful and distinct contacts with a customer, rather than unnecessarily duplicating contacts
- Ask for only the information needed, rather than asking for redundant information ("Asking the customer to start back at square one")
- Give a customer assistance that is consistent with the advice or assistance previously provided, rather than providing contradictory advice
- Solve a customer's problem directly, or hand them off to the appropriate provider who can best assist them, rather than sending them in circles between multiple offices or services
- Obtain and record data that can be used as feedback to improve campus services and products

Some representative examples of tracking and coordinating interactions with campus customers:

- Tracking contacts with prospective students met at recruiting events, applicants for admission, and people writing letters of recommendation (a need of the Graduate Division and their partners within many campus academic departments)

- Tracking contacts with students - and often with their parents, as well - who have specific student services needs related to admissions, registration, financial aid, and a myriad of other domains (a need of several student services units)
- Tracking contacts with faculty who check out audiovisual equipment or reserve technology-equipped classrooms, to identify any preferences they may have or issues they might have contended with, in order to provide better tech support (a need of Educational Technology Services)
- Tracking contacts with interview and focus group participants. When working on this strategy document, we learned after the fact that some campus people we talked with had also been interviewed by our colleagues elsewhere within IST. We could have made more efficient use of our interviewees' time if we could have reviewed one another's data and perhaps even coordinated some interviews.

b. *Create customer relationship profiles.* Customer relationship profiles capture the various relationships which any particular customer may have with the university, so they can better understand that customer's contexts. By knowing their roles and backgrounds, past and present, we can tailor the services we provide to them, better understand the information and requests they provide to us, and give them opportunities to engage with the campus.

As Zane Cooper, IT Director of the Haas School of Business, points out, a particular person might be enrolled as a student in Haas's MBA program, after which they might teach a class in the School, be affiliated with a Center, become an industry contact for internships, become an industry contact for career opportunities, or be a donor. In other words, there are often multiple contexts in which any member of the campus community might be affiliated with Haas, and knowing about their past and current relationships is often vital to working with them effectively.

He described an example where the Dean was scheduled to meet with a key contact and it took several days, with staff in Haas's various units scrambling to look at uncoordinated sources of historical data, to identify all of the contexts in which this person might be related to the School.

c. *Unlock the data required to conduct effective outreach.* Reaching customers who have specific skills, interests, or roles is hard. However, by tracking and coordinating our interactions with customers, and creating customer relationship profiles, as well as by having more in-depth knowledge about campus communities of practice (see section IV.C.1, "Support Communities of Practice," above), we might then have the data necessary to help give our customers opportunities to engage with the campus in ways that may delight them and allow them to share their wealth of skills and experiences with the campus community. By providing that data, and providing ways to meaningfully integrate it, it can be used to conduct effective outreach to individual customers or groups with various commonalities. For instance, it would be highly desirable to be able to notify customers who have particular, specialized interests of donation opportunities, volunteering opportunities, and campus events relevant to those interests.

4. Capture knowledge and make it accessible

A large part of the mission of any research university is the creation of new knowledge, and making sure that knowledge is captured, preserved, and made accessible to future generations of scholars. There is also a similar need in relation to the internal operations of the university. At UC Berkeley, many critical campus activities in staff, teaching and learning, and research contexts are dependent on the knowledge of key long-term members of the community, as well as on the informal working relationships established between those members over many years.

This is of special concern within the next five to ten years, in part because of:

- *Demographics.* Large numbers of long-time campus faculty and employees from the "Baby Boomer" generation are already retirement-eligible, and many others soon will be.

For many years, we have known that the impending retirement of baby boomers will greatly impact the excellence of the university and the quality of its leadership. The day has now dawned when anticipation of these retirements must turn to action.

David T. Miller, outgoing Staff Advisor to the UC Regents, writing in his [letter to the Regents of May 25, 2007](http://www.universityofcalifornia.edu/staffadvisors/documents/dmiller_ltr_regents07.pdf) (http://www.universityofcalifornia.edu/staffadvisors/documents/dmiller_ltr_regents07.pdf)

- *Economics.* Cuts in State funding for the University and campus in FY2008-09, resulting from State budget deficits, may lead to measures such as hiring restrictions, reductions in time and layoffs. There are increasing concerns that this may be only the vanguard of a steep, multi-year decrease in public funding for the University, with a concomitant impact on campus staffing.

With these prospects ahead, finding ways to capture key institutional knowledge and transfer it to new generations of employees is a critical campus need. It should be noted that there are many more aspects to the succession management problem than the collaborative tools-focused issues mentioned here. A discussion of those issues is ongoing on this and many other campuses.

The capabilities of collaborative tools to capture and disseminate knowledge suggest that they may play a significant role in the solution to both the knowledge preservation and ongoing operations problems. However, it should be acknowledged from the outset that, in this area, it can be challenging to identify well-defined, one-to-one correspondences between specific needs and specific tool solutions. Much like the diversity of institutional practices listed above, there are a great many tools that may ultimately need to be used. In addition, some tools which may help capture and share knowledge are identical to, or have some overlap with, tools that support communities of practice (see "Support Communities of Practice", above), and that make it possible to build and deploy interactive, online workflows to encapsulate well thought-out business practices (see "Make Workflows Work", above), so there may be opportunities for certain tools to meet multiple needs. Finally, a number of tools that may be used to capture and share knowledge are relatively new, cutting-edge and untried, especially in large deployments within a university setting.

As we explored these issues across campus, they clustered in several different areas:

- a. Capturing Knowledge
- b. Preserving Knowledge
- c. Making Knowledge Available and Usable

a. Capturing Knowledge

Capturing knowledge involves finding ways to get data out of personal silos - brains and personal data stores - so that it becomes accessible to others. Going forward, it is clear that the campus will need to find or develop tools and techniques that facilitate:

- Getting data out of people's heads and making it accessible to other people with the same goals, concerns, interests.
- Getting data out of people's personal data stores and making it accessible to other people with the same goals, concerns or interests. In particular, a great deal of institutional data is stored within personal email archives. Other data is stored in documents that are accessible only on the author's computer. There are obvious challenges in distinguishing between data which needs to remain personal, or at least restricted to a small number of people, and that which should be made available to a community of practice, or to the institution.

- Getting paper documents into retrievable and searchable electronic form. In an academic context, data sources are starting to be published electronically from the start and projects like the Google Books project are capturing older paper-based documents. In an administrative context, staff are telling us that they need to preserve documents for auditing, recordkeeping etc. Storing these documents electronically offers multiple advantages:
 - We were told that if a paper document is misfiled, it is, for all practical purposes, gone. Electronic storage in a searchable format offers at least the possibility of retrieval, even if a document may be misfiled in a digital context.
 - Electronic storage offers the possibility of eliminating the cost and space associated with maintaining large numbers of paper files.
 - Electronic storage offers the possibility of creating offsite backup copies to guard against and recover from disasters.
- Capturing appropriate contextual information so that the data makes sense in the future. We were told an anecdote about certain equipment being listed in the inventory system as having a location of "behind Arno." Without capturing who "Arno" was or where his office was, that data becomes largely useless in the future.

b. Preserving Knowledge

Once knowledge is captured, it is important to maintain the integrity of that data. There are several aspects to doing so. First, over time, data standards and storage formats change; services and service offerings change; and the media and media readers for digital data can degrade. Second, modifications of the data must be tracked, so that future users of the data can rely on the correctness of the data. This is particularly important in relation to audit and reporting requirements for administrative data. The Media Vault Program (<http://mvp.berkeley.edu>) is working to solve this problem for campus research data, and to an extent, the Document Imaging Project is addressing this for administrative data using ImageNow software (<http://www.imagenow.com/products>). A third challenge involves maintaining the integrity of very large datasets, terabytes or larger in size. These datasets are increasingly being generated within certain fields in the physical and biological sciences, such as genomics, and acquired through instrumentation, such as via sensor networks.

Additionally, many current services on campus allocate data storage to an individual person. When that person leaves campus through graduation, separation, or retirement, the knowledge captured and shared on these services is often lost, even when the data is still in active use. As one example, we heard this concern from graduate students who were concerned that URLs included in published academic works, pointing to supplemental data, would 'break' once they left the university.

c. Making Knowledge Available and Usable

In order for the knowledge that the university has captured or has access to to be truly useful, it must be possible to find, access, and easily make use of it. This has both technical and non-technical aspects.

First, significant amounts of institutional and procedural knowledge is very hard to formally document or define in workflows, and therefore is dependent on finding the person who knows. Someone who has worked for a long time in an academic field, or in a managerial or staff position in a campus office, will come to know many of the people on campus with whom they can collaborate around work – or who can answer questions, provide guidance or advice, or even help navigate parts of the campus bureaucracy. Finding ways to transfer this sort of knowledge and social network to a new generation of faculty and staff is a key component of the succession management challenge on campus.

Second, even when knowledge is captured as data on computer systems, it can often be very difficult to:

- Find a source for the needed data. Especially in the case of campus administrative data, it can be very difficult to determine if a given sort of data is available, and, if so, where that data can be found. Sometimes, when particular data is found, it's available from multiple similar or identical sources, making

it hard to determine the most authoritative, reliable, or up-to-date source.

- Obtain permission to use the data. Whether it's obtaining copyright and reprint permissions for academic work, or approval to use campus administrative data, people across many contexts of collaboration expressed dismay at the difficulty of getting permission to use the data. We also heard that it was often just as difficult to figure out who to request permission from as it was to obtain that permission.

As one example, one interviewee for this strategy document encountered significant obstacles obtaining permission to obtain a database view of the Scheduled of Classes data in order to use it in an online administrative application she was developing, even though that data is world-readable at <http://schedule.berkeley.edu>. Three different campus offices claimed to own that data, and there was no formal process available through which she could request permission to access it.

- Obtain access to the data in a form that's useful. We've heard from multiple people that even after the data is found and all necessary permissions are obtained, it's often hard to access the data in a form that allows it to be easily integrated with other data to produce a composite piece of work.

Because disparate data sources aren't readily available for integration, for instance, a student must identify their degree requirements and status, then go to the General Catalog to find the prerequisites for courses that fulfill those requirements, then go to the Schedule of Classes to find out if a course is offered during the current term and what course and section times are available, then go to an online personal calendar to find out which of those sections don't conflict with their work study job or sports practice hours, and then try enrolling to find out if places are still available in those sections.

5. Facilitate creating content together

Two or more people working collaboratively develop a large portion of the written content that is created on campus every day. Even in the case of a single author, their content is often reviewed or edited by a second person, and frequently even by multiple people. Examples of this content includes:

- Academic papers and books
- Student papers or reports from group projects
- Slides for talks or lectures
- Administrative reports (like this strategy document)
- Budget plans
- Website pages
- Emails that will be sent to a group

In our research, we heard from students, faculty, and staff alike that the process of collaboratively creating this type of content can sometimes be quite difficult, lengthy, and even painful, for several reasons:

- *The laboriousness of manually reconciling changes.* Most groups send successive versions to their members in the form of file attachments. When these files are returned, the original author or another designated editor must manually reconcile the edits and comments from multiple reviewers or contributors, resolving any conflicts and generating a coherent set of revisions. When there are multiple rounds of comment and revision, the group's members and editor must also take pains to avoid inadvertently reviewing or editing out of date versions.
- *Limitations of existing tools.* The "Track Changes" feature of Microsoft Word was often mentioned as a useful tool to help streamline and manage this process, as it makes it fairly easy to see what changes and comments have been made in the document. When a document is shared with multiple people at once, however – rather than being passed along to only a single reviewer or collaborator at a time – it can still be

a challenging process to integrate edits and comments. Furthermore, most content creation applications other than Microsoft Word – Microsoft PowerPoint was an oft-cited example – had limited or non-existent Track Changes-type features.

6. Provide 'lightweight' tools for managing projects

Several of the people we interviewed discussed a need for tools to better support the management of a project, but that were less complex and easier to use than full-fledged project management software package like Microsoft Project.

This need appeared across multiple contexts, including staff managing ongoing or project work; students managing work for a class, group, or thesis project, and researchers managing a research project. They expressed a need for features including those below, but emphasized that ease of use and simplicity were key:

- Developing realistic schedules
- Identifying resources and their dependencies
- Tracking tasks being performed by individual members or sub-groups
- Overseeing progress toward intermediate milestones and larger goals
- Allowing multiple people to view and update information in the schedule

7. Make selected improvements to infrastructure and existing services

There were also a number of common requests for enhancements to current services that we heard expressed in multiple contexts. While these needs were widely expressed, none were mentioned as prominently in discussions about how to better support collaborative work on campus, nor do most of these rise to a strategic level.

Email enhancements

- Larger default disk quotas
- Being able to be charged for (and recharge extramural funding accounts for) actual use of larger disk quotas, rather than for the maximum, fixed sizes of those quotas
- Self-administration of accounts; e.g. setting up accounts for new staff or visitors when their paperwork hasn't yet cleared. The process of adding new affiliate accounts to the HRMS/CalNet system has been considerably streamlined recently, although the perception may linger that this is a difficult and time-consuming process
- Longer mail forwarding times after separation, or permanent email addresses. This need appeared both in academic contexts where a Berkeley email address may appear on published work, as well in a student/alumni context where correspondents may not have any other way to get in touch
- Dynamic mailing lists that automatically reflect various communities, work roles, changing email addresses, etc., and are kept up to date
- Tighter integration with calendaring/task management (also mentioned in Calendaring, below)
- Archives of mailing lists, with search capabilities. Some of these archives will need to be public, others restricted only to members or to particular communities or roles. (Example: BITS Forum.) Can be provided within lists.berkeley.edu, and/or contexts of collaboration workspace tools such as bSpace and CalShare

Calendaring and scheduling system enhancements

- Integration of disparate systems for scheduling meetings and viewing one's work and personal calendars. CalAgenda, departmental Microsoft Exchange calendars, integrated systems (e.g. UHS's clinical practice system)
- Extending the reach of the CalAgenda service to more employees, and to students

- Tighter integration with email, a la Microsoft Exchange and Outlook
- Improving the way that rooms and other campus facilities are scheduled and allocated. Currently at least five departments use Dean Evans & Associates' EMS software (<http://www.dea.com>), to accomplish this goal. This and other similar software gives considerably more capability and control for resource allocation than the first come/first served model for resource allocation in most calendaring systems. Expanding the use of EMS into other campus scheduling contexts may be an example of a "low-hanging fruit" opportunity, as the large initial license fee has already been paid by several campus departments, and additional departments may be able to share this license via a cost-sharing arrangement.

File sharing enhancements

- Temporary places to put up really large files for access by campus or off-campus collaborators. Cal WebFiles provides this type of service, but its quotas are smaller than the sizes of some files that need to be transferred.
- Persistent URIs, through which data can be accessed even if its authors or maintainers leave the university. These URIs would be particularly suitable for inclusion in journal articles and other published works.
- Permanent, long-term storage and hosting, where papers or datasets can be made accessible for many years via inexpensive, secondary storage.

Support

In our discussions, there was a nearly universal desire for improved support for collaborative tools and practices:

- Training on goals and concepts, not just tool functionality. Several of the people we talked to mentioned that training may have been provided on the mechanics of how to use a new tool, but that training often does not ensure that the people using that tool will know how to apply it to the types of tasks they encounter in their work, collaboratively or otherwise.
- Guidance and consulting on collaboration tools. A number of respondents expressed the desire to talk with experienced consultants, who could guide them, for instance, on whether to use a wiki for a particular task, and if so, which one to select; or could discuss at some length with them which collaboration suite might best meet their needs.
- Guidance and consulting around website-related tools. While not specific to the scope of this strategy document, we learned that maintaining websites and increasingly, building or adapting online applications that are deployed via the web, is a nearly universal activity within campus units. Similar to the previous point, there is a need for expert guidance on selecting and deploying website-related tools, ranging from content management systems to web application development environments, as well as around website-related utility services, such as analyzing whether visitors are finding campus websites to be of use.

Addressing the campus's "digital divide"

There is a great disparity in the level of resources available across different contexts of collaboration and across different departments. While this disparity isn't specific to the context of this strategy document, it nonetheless exerts some impact on the extent to which collaboration tools can be productively adopted by the campus:

- Financial resources. The ability to afford new tools, infrastructure, and services varied widely across the contexts of collaboration and departments that we explored.
- Planning resources. Many people we talked to discussed having to operate and react to changes in a purely tactical, reactive mode, because of a lack of resources to think and plan farther ahead. ("We'll be happy if the server doesn't break tomorrow.")
- Network resources. Access to high-speed networking varies widely across collaborative contexts. This shows up both on campus, where we hear from people who work in buildings with outdated network equipment and students who ask for wider AirBears coverage; and off campus, where researchers or students in the field may have limited or no access to Internet connections of any kind, much less high-speed access. This causes particular difficulty for newer online applications that assume their users have broadband or faster access.

Other improvement requests

Finally, there were a number of requests for generalized improvements to campus IT systems and practices:

- Usability improvements. Many different campus systems were individually characterized as difficult to use. These systems typically offer huge numbers of capabilities, but are correspondingly complex. This sort of comment came up most frequently around systems that were only used occasionally, such as only at the start of each semester.
- Accessibility improvements. Some campus systems were developed without taking accessibility into account, and may be difficult to use by persons with physical disabilities, such as vision or motor impairment.
- IT purchasing coordination improvements. Several people commented on redundant software licenses, duplicate subscriptions to services, and other evidence suggesting that economies of scale – on pricing, purchasing costs, and support costs – might be realized through better coordination around IT-related purchases from vendors. The BITS Forum, a mailing list around software licensing and vendor relationships, is one mechanism through which this type of coordination is carried out, with evident benefits to the campus, but clearly more can be done in this area.
- Innovation uptake improvements. Evolving a model in which decentralized innovation and initiative can be brought into the mainstream of campus IT offerings, while not "getting in the way" of innovators in the process, can be a terrific way to leverage the wealth of talent on the campus. "Our Unit," a suite of online modules for managing many aspects of a department or unit's operations, is an example of a decentralized innovation that has been rapidly adopted and found highly useful by many campus departments, but which can't yet be offered to everyone on campus because of lack of resources and concerns over ossifying its development work. Two examples of past situations where innovations were successfully brought into the mainstream, with considerable benefits to the entire campus, were Public Affairs' work on the UCB Events Calendar, stemming from a student project within what is now the School of Information; and the Laptop IP Service (LIPS), in which IST extended a network registration service that was developed by the computing unit of Residential and Student Services.

8. Provide adequate physical space for face-to-face meetings

While it is beyond the scope of this strategy document, which focuses on technologies to better support collaboration, we found that much of the collaboration on campus still occurs in face-to-face meetings without technological intermediation. We were also told that, for certain purposes, face-to-face collaboration is simply the most effective type of collaboration possible.

Finding space for this in-person collaborative work is an issue for many different portions of the campus community. For employees, this can show up as a simple lack of space or meeting rooms. This can pose a more complex challenge for units whose members are housed in multiple different physical locations, often spread widely across campus, the city of Berkeley, or farther flung places, and who require space for occasional in-person meetings.

This lack of meeting space may most profoundly affect undergraduates. Whereas faculty, grad students, and staff each have some space to meet (even if it's highly limited or inconvenient), undergraduates often do not. In our discussions with undergraduates, some of the things they wished for in physical meeting spaces were:

- Easy to reserve. Currently, many of the spaces have to be reserved in person through the campus life and leadership office, which can have a half-hour long line.
- Student-friendly space. The space should allow the students to be themselves, have food, talk in a normal voice, etc.
- AirBears coverage. For many students their "life is online," preventing them from being fully productive if they can't get connected.
- Have simple tools like whiteboards (or chalkboards) and printers in the space
- Have sufficient power outlets for laptops
- Be available at odd hours. Most undergraduates do not keep to an 8-5 schedule.

D. What are the services and service models being offered by external providers?

1. Externally hosted collaborative tools (Software as a Service)

One of the newest developments in the Collaborative Tools area are tools provided in a Software as a Service (SaaS) model, via a user's web browser. As part of this strategy development effort, a group of campus IT leaders had several meetings with external providers of this variety of collaborative tools, including Microsoft's Live@EDU team, Google's Apps for Education team, and Yahoo/Zimbra. As the major players, we believe that these vendors are broadly representative of the capabilities and hosting options in this market.

Several themes emerged from the discussions with Google, Yahoo, and Microsoft:

Deployment models

Google, Microsoft and Yahoo all offer different models for hosting the services they offer.

Microsoft

Services include Live@EDU (including email, file sharing, and instant messaging), Exchange Labs (hosted Exchange), and Office Live (hosted sharing environment based on SharePoint). The cost of hosting these services is borne by Microsoft and is supported by ad revenue. Microsoft disables ads in email for current students in Live@EDU. See the following sites for more details on their service offerings:

- Live@EDU: <http://get.liveatеду.com/Education/Connect/FAQ/>
- Exchange Labs: <http://technet.microsoft.com/en-us/exchangehelp/exchangelabsedu/>
- Office Live Workspace: <http://workspace.officelive.com/FAQ>

Google

Google Apps for Education include email, instant messaging, and document/content creation tools. The cost of hosting these services is borne by Google and is supported by ad revenue. Google disables ads in email and other collaborative tools for Students, Faculty, and Staff. Ads will be turned on for alumni and other former members of the campus community. See the following site for more details on their service offerings:

- <http://www.google.com/a/help/intl/en/edu/index.html>

Yahoo/Zimbra

Yahoo is planning to offer hosted services, focused around Zimbra Collaboration Suite. They plan to release more details about this offering during 2Q 2008.

In-house services based on the Zimbra Collaboration Suite are also available. The software is free and open-source, but the cost of hosting would still be borne locally.

Yahoo has also talked about offering a hybrid hosting model, allowing a seamless integration of accounts hosted at Yahoo with accounts hosted locally. This model is interesting in the possibilities it offers in the realm of privacy and legal concerns. It would allow the university (or even individual account holders) to make decisions about whether to have a given account's information hosted locally or at the service provider.

Rapid development, short-term planning

The market for and capabilities of online collaboration tools, suites, and platforms has expanded tremendously in the past 18-24 months. The capabilities of tools in this area are growing so quickly that vendors are generally not planning more than 6-12 months into the future.

Email and Calendaring

Most vendors started their offerings in this space with services focused around Email, and Calendaring. These offerings are generally rebranded versions of their consumer email and calendar products (e.g. Microsoft Hotmail and Google Gmail). Recently, the vendors have started to add more enterprise-class features to these offerings, such as IMAP or POP access to email, calendar integration with Outlook, etc. This is designed to limit the disruption of any migration from legacy services to these services, and also has the benefit of making the services easier to use from an accessibility point of view.

Collaborative Content Creation

Google (Docs, Presentations, Spreadsheets), Microsoft (Office Live Workspace), Yahoo (Zimbra Collaboration Suite Documents) and other companies like Zoho (<http://www.zoho.com/>; Writer, Sheet, Show) have been making significant progress with collaborative content creation tools. Hosted tools such as these offer interesting possibilities and capabilities beyond traditional productivity software like Microsoft Office. In particular, these tools offer the ability to keep track of multiple subsequent versions of a document and have everyone working on the document always have access to the most current version. Google Docs offers particularly interesting capabilities in this regard, as it allows multiple people to view and edit the same document simultaneously, keeping the document up-to-date for all users in near-real-time.

External Data Sources

The collaborative content creation tools from Google, Yahoo, and Microsoft are just starting to include tools that allow the integration of external data sources into documents created in these tools. For example, Google Sheets now allows the user to embed Google Gadgets (<http://www.google.com/ig/directory?synd=open>) in a spreadsheet, and Yahoo's Zimbra Collaboration Suite includes Zimlets (<http://www.zimbra.com/products/zimlets.html>) that allow access to external data in many contexts within the product. We have not yet seen any substantial integration of content sources like online journals or the Google Books project into these tools.

2. Open- and community-source software

There are many open- and community-source collaborative tools available, including several that are currently being used to run prominent, mission-critical collaborative tools on the UC Berkeley campus, including:

- CalMail. CalMail is the central email service on campus, with over 65,000 accounts. It uses open- or community-source products, including the Linux operating system (<http://www.linux.org/>), MySQL databases (<http://www.mysql.com/>), Cyrus for IMAP and POP access (<http://cyrusimap.web.cmu.edu/>), Exim for SMTP (<http://www.exim.org/>), and SquirrelMail for Web access (<http://www.squirrelmail.org/>).
- Lists.berkeley.edu. Lists.berkeley.edu, a CalMail-related service, provides electronic mailing lists. Any member of the UC Berkeley community can create and manage their own mailing lists through a sophisticated web interface. It uses Mailman (<http://www.gnu.org/software/mailman/index.html>), a community-developed mailing list management package.
- bSpace. bSpace is the official online teaching and learning environment for campus. It provides a site for each course on campus where the instructor and students can interact and share information. It also currently serves several thousand "project" sites, where any member of the campus community can create a site with numerous collaborative tools available for a group of people—including off-campus people—can work together on a project. It's based on Sakai (<http://sakaiproject.org/>), which is being developed through collaboration between a number of universities worldwide.

The teams running these services are also active participants in the communities that create these products, allowing the university to influence the future directions of these tools.

Additionally, the campus is making a major investment in, and is a key partner in the creation of, the Quali Student community-source student service system (<http://www.kuali.org/communities/ks/>). This system is the key to our Student Systems 2012 initiative (<http://students.berkeley.edu/wiki/ow.asp>).

In addition to these prominent systems, there are many other open- and community-source products in use in departments on campus. Many departments have started to use blogs (e.g. WordPress or MovableType), wikis (see <http://en.wikipedia.org/wiki/Wiki> and <http://www.wikimatrix.org/>), and content management systems (e.g. Drupal or Plone) from open- or community-source providers.

Paul Fisher and Jim Blair of IST's Infrastructure Services have developed a detailed Integrated Messaging/Open Collaboration Stack proposal to support many key collaborative activities with open- and community-source software. See http://collab.berkeley.edu/projects/cctsd/related_info/open_collaboration_stack.pdf

Generally, open- and community-source software is available for free, with support packages available from assorted commercial vendors. The cost of hosting the software is borne locally.

3. Commercial software

There are far too many commercial products and vendors offering tools in this space to mention. Some of the more prominent players with collaboration tools offerings include:

- Microsoft. Offerings include SharePoint (<http://www.microsoft.com/sharepoint/>), which is implemented on campus as the CalShare service (<http://calshare.berkeley.edu>), and Exchange (<http://www.microsoft.com/exchange/default.mspx>), which provides email and calendaring service in several campus departments.
- Oracle. Offerings include the Oracle Collaboration Suite (<http://www.oracle.com/collabsuite/>). The calendaring portion of the Oracle Collaboration Suite is implemented on campus as CalAgenda, the campus's shared calendaring service.
- IBM/Lotus. Offerings include Connections (<http://www.ibm.com/software/lotus/products/connections/>), Quickr (<http://www.ibm.com/software/lotus/products/quickr/>), and Notes (<http://www.ibm.com/software/lotus/products/notes/>).

This software must be licensed from its vendor, and the cost of hosting it is borne locally.

4. "The Power of 10"

Any of the models above can be deployed not only by an individual campus, but throughout the UC system. Indeed, "the power of 10" UC campuses promises increased efficiencies in all aspects of Information Technology service provision. The UC-wide Information Technology Guidance Committee recently completed an 18-month "process to identify and recommend strategic directions to guide investments in information technology (IT) and the academic information environment." Key recommendations in the collaborative tools realm include:

- The University should deploy IT infrastructure, tools and services to support collaboration within the UC community.
- The University should create the capacity to manage scholarly digital assets in part by adopting strategies to ensure that the information produced in the course of research and instruction is effectively secured, managed, preserved and made available for appropriate use by others.
- The University should cultivate organizational leadership for instructional and student technology to guide and facilitate campuses working together to explore models for providing learners with enhanced and new it-enabled educational opportunities.

For more information on the ITGC report, please see <http://www.universityofcalifornia.edu/itgc/>

E. What are the costs of campus services and alternative services?

As part of the work on this strategy, the team was asked to establish the current costs of delivering collaborative tools to the UC Berkeley campus and the potential savings or costs associated with other sourcing solutions. This was largely impossible to establish due to a lack of available costing data from UC Berkeley departments or other comparable institutions. In most cases, other than perhaps email services, we find that departments are not tracking costs down to the collaborative tool level. Even with email costs, making comparisons of like-to-like was largely impossible due to the different accounting and tracking methods of different service providers. So, we have chosen to forgo an attempt at this comparison at this point.

Considerable effort has been expended doing web searches trying to track down existing industry standards for estimating costs of collaborative tools. We've looked at the Stanford/MIT IT Spend report and different campus websites (University of Washington, University of Minnesota, University of Michigan) but have not found any information on collaborative tool spend. Emails have been sent out to different mailing lists, including attendees of the UC-wide Computing Services conference (UCCSC), the Common Solutions Group (<http://www.stonesoup.org>), and various IT-related lists on campus. The Burton Group has been contacted but their response was "that we don't have information on standard costs for collaborative tools." So far none of these sources have been able to provide any costing data. A discussion is scheduled with Gartner Research, and we hope to have results from that discussion soon.

As discussed in item D.1, above, Microsoft, Yahoo, and Google are offering collaborative tools on a free or highly-subsidized basis to current members of the campus community. This does not, however, reflect the actual cost to the University of delivering a service based on these offerings, as there would be significant user support and transition costs. We estimate that the ongoing user support costs would be roughly equivalent to the support costs for the services currently offered by campus. This does not include transition costs associated with any major change to existing services; or additional introductory and ongoing support costs for any new services such as student calendaring or tools like Google Apps.

F. What are other peer institutions doing? Why?

Many of our peer institutions are also evaluating alternatives for providing collaborative tools. Through our research, we found that our peer institutions tend to fall in two categories. The first is institutions who, like us, are at the stage of actively examining the risks, rewards, and possibilities of alternative sourcing strategies for collaborative tools. Most R1 research universities fall into this category:

- An article from the Chronicle for Higher Education with a good overview of the issues surrounding many universities' deliberations on and decisions about externally-sourced collaborative tools can be found at <http://chronicle.com/weekly/v54/i18/18a00103.htm>
- Processor Magazine ran an editorial discussing the pros and cons of outsourcing email. While this article is approximately 3.5 years old, it does discuss many of the relevant issues. (<http://www.processor.com/editorial/article.asp?article=articles/p2640/24p40/24p40.asp>)
- The Consortium on Fostering Interdisciplinary Inquiry, especially the "Collaborative Technologies" functional committee, is also exploring these issues. See <https://www.myu.umn.edu/metadot/index.pl?id=1562406> for more information.

The second category is institutions that have already chosen to take advantage of the services offered by one or more providers like Google, Yahoo, or Microsoft. Interestingly, we were not able to find instances of institutions that had explicitly decided against using these tools, nor were we able to find institutions that had experienced "buyers remorse" and backed out of an implementation of externally-sourced collaborative tools. (To the latter point, though, these service offerings have only existed for the past 18-24 months, which may partly explain this.) Schools that fall into the second category include:

- *Arizona State University*. See <http://www.informationweek.com/news/showArticle.jhtml?articleID=198100546> and http://www.google.com/a/help/intl/en/admins/case_studies/asu.html
- *University of Pennsylvania College of Arts and Sciences*. See <http://www.microsoft.com/casestudies/casestudy.aspx?casestudyid=4000000874>
- *Louisiana State University*. See http://www.educause.edu/ir/library/pdf/ecar_so/erb/ERB0623.pdf
- *Northwestern*. See <http://chronicle.com/live/2008/01/woodward/> and http://www.google.com/a/help/intl/en/admins/case_studies/northwestern.html

G. What are other policy, legal, etc. issues we need to be aware of?

1. Advice from the Samuelson Clinic

We asked the Samuelson Law, Technology & Public Policy Clinic at UC Berkeley Law to comment on the potential for using externally-hosted services to provide collaborative tools to the UC Berkeley Campus Community. The Samuelson Clinic describes itself as:

"The Samuelson Law, Technology & Public Policy Clinic at UC Berkeley Law represents the public interest in sound technology policy through client advocacy and participation in legislative, regulatory, litigation and technical standard setting activities. The Samuelson Clinic functions as both a traditional legal Clinic and as a site of interdisciplinary, policy-relevant research. Graduate students from across the UC Berkeley campus collaborate with law students to solve problems that are beyond the scope of a single investigator and discipline. This format assists students in identifying and testing research theories, cultivates interdisciplinary thinking about policy questions, and provides an opportunity to translate research findings into policy recommendations and advice.

"Since its founding, the Samuelson Clinic has been extremely successful in a broad range of matters in the digital realm, working with nonprofit organizations, government agencies and legislators, and academic researchers across a range of issues including free speech, privacy, intellectual property, electronic commerce, voting systems, and open source software. Recently, the Samuelson Clinic has expanded its interdisciplinary research and clinical representation into the life sciences. As significant high-tech advances continue in biology, chemistry, nanotechnology and genetics the clinic is poised to extend its work to ensure that the public interest influences the legal, policy and technological developments in these diverse fields." [Paraphrased from Clinical Professor Deirdre K. Mulligan, Director, Samuelson Law, Technology, & Public Policy Clinic, on <http://www.law.berkeley.edu/samuelsonclinic/welcome>, accessed on 3/20/2008.]

We asked them to comment on the following issues:

- What concerns should we have about having campus data hosted on a service that's not owned by campus? What are the risks?
- How should we as a campus think about the balance between privacy, data protection, cost, and capabilities?
- What sorts of questions should we be asking in this area when we're talking with providers of collaborative tools?
- Does it make sense to think about our users in different ways (e.g. students as distinct from Faculty and Staff?)
- What assurances/agreements should we be looking for in contracts? (Or are these sort of contracts not enforceable enough to make a difference?)
- Is there anything else we should be considering that we haven't thought about?

Their advice follows:

To: Ian Crew, Alana Pechon, UCB IST & UCB I-School
From: Jennifer King & Chris Hoofnagle, Samuelson Law, Technology, and Public Policy Clinic, UCB School of Law
Re: Legal and Other Issues With 3rd Party/Collaborative Tools
Date: March 19, 2008

You asked us to review potential legal, privacy, and security issues that the University should consider in exploring potential agreements with third party service providers for collaborative web services. Presumably, the typical service the University would consider would provide Internet-based applications to UCB faculty, staff, and students in an environment where data produced and provided by UCB users would be stored by the provider on the provider's servers and not by UCB.

A key starting point in any discussion with any third party service provider is to first ask for a written document describing their policies regarding legal process, data retention, data breaches, and security. A lack of written documentation may indicate the provider has not yet considered these issues in depth.

What follows are a number of questions, organized by area, that University representatives should ask of any potential partner with respect to criminal and civil data requests, data lifecycle and location issues, security, and privacy. IST may also want to review EduCause's (educause.edu) library for relevant articles on educational technology.

In terms of weighing these issues with the benefits offered by third-party providers, there really isn't a clear answer -- it partially depends on the level of risk the University is willing to accept, and what of the below issues are of paramount importance to the University. Furthermore, there is the reality that while the University may wish to exert control over information requests, especially those that may be overreaching or infringe on academic freedom, the practical issues of managing that process when it is partially outside of the University's control may be daunting.

Please don't hesitate to ask us if you have additional questions about this document.

Criminal Information Requests

- Generally, how are law enforcement requests for information be handled? Would the provider pass them along to the University to evaluate on a case-by-case basis? Are they able to do this?
- Would the provider make all decisions regarding which to comply with and which to fight, or would the University have discretion? Under what circumstances would the provider be motivated to fight overreaching requests?
- Has both the University and the provider considered the different types of process that they may receive:
 - Criminal search warrants
 - Grand jury subpoenas
 - Administrative subpoenas (including national security letters)
 - ECPA
- Does the provider have a process for determining whether the government has authority to ask for the data in question?
- Who is the "subscriber" who gets notice--the end user? the end user's supervisor? The UC general counsel?
- Under what circumstances would the University wish to fight law enforcement requests for user information and/or data?
- In what format will the service provide the data--will they give the government the actual media, or just the information requested?
- How will the provider determine how much is too much to give, and how much is too little?

- How will compliance be operationalized (i.e. the attorney doesn't go get the records-- usually they have to have an engineer with a clearance or special training to fetch it, or have internal tools in place to deal with requests on a large scale).

Civil requests

- Would the provider or the University be responsible for notifying UCB users? How would this be handled both in terms of expeditiousness as well as being able to personally identify the user (would the provider have any personal data or account information about campus users? Or would the University manage that data and the process?)
- Under what circumstances will the provider or the University decide to resist a civil request, especially if the request infringes on academic freedom (i.e. outing an anonymous critic, a research subject, etc.)?

Data "Ownership" and Lifecycle

Even in the event a contract with the provider and the University states that the University (and/or individual users) retain ownership of the data, the following questions are relevant:

- How many copies/back-ups exist in the system?
- After a user deletes content or an account, how long until the content or the account is completely flushed from all archives?
- How long may accounts remain idle before data and the account is destroyed? What about graduating student accounts?
- What kind of demarcation will exist, if any, between the provider's typical service and the service provided for UCB? How does this effect user data?
- Where are servers physically located?
- Will any data be stored outside of the United States? Will any data cross US borders to reach the user?

Security

- How is data secured, both digitally and physically? Is encryption an option?
- Will the user be required to create a provider account for authentication, or will a Cal ID be used?
- Is notice given in the event of a security breach (in states where notice is not legislated)? Who manages breach events?
- How are threats to internal security (i.e. the service provider's employees) managed? What restrictions exist to prevent employees from obtaining either account information or user data without explicit authorization?

Privacy

- Would University users be bound to the provider's privacy policy? Could the University request terms that are more restrictive than the provider's? (Note that a privacy policy is less important than having good policies on use of data, retention, etc.)
- Will user generated content be publicly viewable? Or will users be able to restrict public access?
- What type of fine-grained privacy controls exist for users to manage their data?
- What information is required from users to participate?
- Will restrictions be possible to limit viewing to UCB users only in some circumstances?

2. Concerns from the 2007 Campus Collaborative Tools Partnership Investigations Report

In early 2007, a diverse committee of campus leaders met with representatives from Google and Microsoft to explore the Google Apps for Education and Microsoft Live@EDU service offerings and to determine if these

vendors' offerings in the areas of mail, calendaring, and web based file sharing are a reasonable alternative to UCB running these services locally (via the current CalMail, WebFiles, and CalAgenda services). See <http://dsblog.berkeley.edu/2007/06/25/report-on-campus-collaborative-tools-partnership-investigations-project/> for the full report from that project. The committee expressed a number of concerns in the policy, privacy and legal realms related to externally-sourced services. These are quoted below:

4.2.1. Privacy

The way subpoenas are handled is a critical issue and one that a number of committee members were concerned about. Because of recent laws (such as the Patriot Act), we might not even know about, much less have an opportunity to fight, a subpoena for the discovery of University data delivered to an external vendor.

Potential contractual remedies or workarounds for subpoena and other privacy problems are still a somewhat gray legal area, which have not been fully tested in the courts. There are different levels of legal protection that we'd want to provide to different classes of users. We would want to offer extensive protection to current students, faculty, and staff (e.g. *in loco parentis* for students still exists in perception, if not in law), but probably not so much for alumni (i.e. alumni would be expected to respond to their own subpoenas as opposed to our legal department doing so).

4.2.2. Legal and Policy Issues

As these services are offered at no monetary cost to UC Berkeley, it's unlikely that there would be any real provision in a vendor contract to make the University whole if the vendor violates the contract via actions such as:

- Losing University data.
- Violating law or policy in their handling of University data.
- Causing harm to members of the University community through their handling of
- Privacy incidents, as per the discussion in the privacy section.
- Radically changing the terms of service, such as by imposing new charges for service or by removing or restricting some of its offerings.
- Terminating the service.
- Having any real contractual leverage with a service provider requires paying that vendor a fee.
- At current rates for each vendors' paid services, this would eliminate much of any potential cost savings.
- The vendors both stated that handling of UC or campus policy issues, as distinguished from legal issues, is generally left up to us. Conflicts between UC or campus policy and the vendors' own policies regarding privacy, acceptable use, and the like would need to be negotiated contractually. As noted elsewhere, it is not clear what remedies we might have if policy conflicts occur.
- There is some chance we could work out the privacy, legal and policy issues via our lawyers, but it only makes sense to try to do this if the service offering is highly compelling.
- When the possibility of a partnership arrangement was mentioned to the Chancellor (whose approval, as well as that of the Academic Senate, would be necessary), he had three questions that should be included in our considerations of any potential partnership:
 - What would be the effect of outsourcing on UCB?
 - What would the effect be of UCB outsourcing on other public schools?
 - What would be the effect of UCB outsourcing on other UCs?