Benchmarking information technology services has become a vital activity for colleges and universities. The COSTS Project (http://www.costsproject.org/), which Karen Leach and I started in 1996, is an ongoing quantitative effort to benchmark the costs of providing IT services in higher education; the project helps institutions understand their IT budgets and staffing relative to peer institutions. Recently, however, I undertook a different type of benchmarking. I spent more than nine months at peer institutions in an effort to get a nonquantitative impression of where my institution, Hamilton College, stood in relation to others in areas that we consider strategic for IT.

As the head of IT at Hamilton, I periodically receive notes from trustees, administrators, parents, alumni, or other interested parties asking about an article they have read describing some application of technology in a college setting. The article typically extols the benefits of the application and how it is “revolutionizing” the educational environment at this institution. The note-writers invariably ask, “What are we doing about this at Hamilton?”

I decided that it would be valuable for me to visit some other colleges and universities in order to see for myself what they are actually doing. My plan was to select a group of peer institutions and ask each of my counterparts if they would allow me to visit for approximately one-half day. I suggested a range of possible IT topics that they could tell me about: (1) supporting the academic program; (2) providing campus-wide infrastructure; (3) using the Web to engage external audiences; and (4) enhancing overall efficiency of institutional operations through technology. They could tell me about any technology practices they were most proud of or any issues on which they had gained insight into solutions. My promise to each institution was that I would share what I learned. Although I had no formal means of evaluating the success of what my counterparts might report to me, I could compare reports across campuses.

Getting away from one’s own environment can be highly energizing, eye-opening, and educational. However, it should be noted that the excitement I derived from these visits was often tempered by the anxiety my staff would feel when I returned. I would come back to Hamilton with lots of new ideas based on what I had seen at other institutions. Sometimes my comments were viewed as criticisms of what we were doing or as mandates to do something different. My staff was good at reminding me that we were doing many excellent things ourselves and that often I was unaware of similar practices we were already using.

My odyssey began in October 2002 in Maine. Fifteen thousand miles and twenty-eight institutions later, I am now prepared to make good on my promise and share what I learned. This article synthesizes and distills the information that was reported by my colleagues around the country.

Support of the Academic Program

Teaching and learning constitute the core of the mission at the institutions I visited, so I expected that I would hear much about the use of technology in support of
the academic program. And I did. If there was ever a period when IT organizations had the time to be evangelists, that era has passed! These campuses have all they can do to support those faculty members who are already interested in using technology resources in connection with teaching.

Organizational Structures
How the campuses organized to provide this support was often cited as something the institutions felt was successful. Approximately one-third of the institutions told me about an academic support model in which some IT staff are allocated to departments, divisions, or constituents rather than serving as a general resource. One purpose of this staffing model is to provide an IT support “face” that is recognized by the faculty being served. Institutions have come up with a variety of names for these staff (e.g., Academic Instructional Associate, Curricular Technology Specialist). Such a person might be assigned, for example, to the Social Science Division faculty. This person would be the first point of contact for the instructional needs of these faculty. In some cases, the person would be located in the same building as the faculty members. The technologist would still draw on the general expertise of other members of the IT organization, but the faculty member would not have to know where that expertise resided.

Although the primary responsibility of this constituent-based model was to help faculty conceptualize and plan for the use of technology in pedagogy, the technical staff often dealt with the full range of problems, from solving printer problems to upgrading the computer on a faculty member’s desk. Institutions using this structure are struggling with how to prevent help-desk-type calls from consuming these specialists’ time. In some cases, specialists reported that 80 percent of their time was utilized for these urgent and/or immediate needs. Yet as expected, the technologists with this department or division focus indicate that they understand the needs of their users and enjoy the relationships that they develop with their constituents.

Library/IT Collaborations
Several institutions have realized the value of collaboration between librarians and technologists to support the needs of faculty and students. Although only one-fourth of these institutions have actually combined the IT and library staffs under one CIO, many more have established formal relationships to provide a single point of contact for support needs related to the academic program. In one model, faculty considering using technology in connection with their teaching work with a team consisting of a reference librarian and an instructional technologist. The team helps to provide support for the content, technology, and training that students and the faculty member need, including assistance with developing doable assignments for students.

A problem that many institutions are facing is the shortage of space in their libraries to house growing collections. The most forward-looking are using this challenge as an opportunity to consider IT/library collaboration or the creation of shared services such as an “information commons.”

Support Models Involving Students
Involving students in the support of faculty is a cost-effective and sensible approach. A number of interesting models are in use. Several institutions have developed summer programs, originally supported by grants. A small number of students are given several weeks of intensive training and are then assigned to work with a particular faculty member on technology projects for the remainder of the summer. Faculty apply for entrance to this program, usually on the basis of how their projected technology use will affect their teaching. Students and faculty are generally paid for their participation. These programs tend to be expensive to run and require intense involvement of technology staff during the summer months, when there are competing demands on their time to get ready for the fall semester. The number of faculty and student assistants is generally limited by available finances and staff resources, but the programs are successful in engaging small groups of faculty in more intense technology use. If these programs are focused on tenured faculty, they can have a substantial effect over time as the base of knowledgeable faculty increases.

Institutions are using three common models for ongoing student support of basic faculty instructional needs, such as digitizing materials. In the first—the service bureau model—support centers are managed by technology staff, with the work being done primarily by students. The students in one such center viewed this work as the most interesting jobs on campus because of the variety of hardware and software they learned to use.
One institution is creating a video archive of interviews with faculty who have applied technology to their teaching. These interviews will be available on the institutional Web site so that other faculty can access the materials whenever their interest is piqued. By making the interviews Web-based, the institution can also annotate them with examples of the actual materials that the faculty member created or used.

**Teaching Spaces**

Most of these campuses have robust infrastructures consisting of high-speed connections throughout the campus. But deciding how many classrooms to equip—and with what technologies—can be a complex challenge given the variety of class sizes, teaching approaches, and technologies used. Institutions are increasingly realizing that the total classroom environment has to be enhanced, including furniture, lighting, and acoustics, in order to really make the environments conducive to learning.

A multi-level taxonomy for these classrooms is commonly used. A classroom is called **technology-enhanced** if it contains at least a permanent data projector and a computer connected to the projector for presentation. These rooms might also have a variety of installed audio-visual equipment (e.g., DVD/CD player, tuner, VCR). **Technology-intensive** classrooms have all of this equipment plus computers at some or all of the student locations. Various configurations are being used in these rooms, including computers in traditional rows facing the front of the room or computers around the outside of the room with a seminar table in the center of the room. Variations of this second model seem to find favor with most faculty because they can choose when and how they use technology without being concerned that students are distracted.

A small number of institutions are experimenting with eliminating the computer in the lectern at the front of the room and instead assuming that the presenter will bring his/her own laptop to connect to the data projector. In such institutions, the trend is to encourage faculty to use a laptop as their one institutional computer or to set up pools of laptops that can be checked out. The “laptop-only” model, like all other approaches, has trade-offs. On the plus side, faculty members have a high assurance that the demonstration they want to give will work the same way in the classroom as it did in the office. Any special materials (e.g., databases) that are needed will be available in the same way that they are in the office (e.g., over the network). This approach also lowers the cost of equipping and upgrading the classrooms and...

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The student “wizards,” as they called themselves, were able to meet faculty needs in a timely and predictable fashion and with a real sense of service to the faculty. Effective management and procedures were critical to the success of this model. Interestingly, many libraries are using this kind of model for creating electronic reserve materials, although more of this work tends to be done by regular library staff.

The second model—the **learning center model**—is based on the premise that faculty will learn how to do simple technology support themselves if they are provided with proper instruction. However, many faculty, especially in the early stages of technology use, find that learning to do scanning or other digitizing is time-consuming, and they view it as a roadblock to achieving their pedagogical goals.

Finally, the **mixed model**—consisting of a support center coupled with the availability of training—seems to be the most effective and appreciated model for faculty. Faculty members who frequently need support right away will see the benefit of learning to provide that support themselves, whereas those who plan ahead to a greater degree will make efficient use of the service bureau. This approach also provides a means of distinguishing between new technologies, which have a steep learning curve, and those that are mature enough to be learned by the average user.

**Communication Mechanisms**

One area of particular interest to me is how to keep the discussion about faculty use of technology vibrant on campus. The answer seems to be to tie it to broader institutional themes. One particularly effective model is built around institutional centers that focus on teaching. With names such as “the Center for Innovation in the Liberal Arts” and “the Center for Scholarship and Teaching,” these are led by faculty members—and that’s the key to success. These centers serve to keep the faculty dialogue going and provide a vehicle for interaction with support staff. Several alternative approaches have also been created: periodic lunch gatherings, technology shows, newsletters, and summer seminars in which faculty gather for intense training and curricular discussions.
simplifies the control mechanisms in the room. Negatives of this approach are that the faculty member has to carry the laptop to class along with other materials and must allow for the necessary time to connect the laptop to the data projector and start the system up. Requiring faculty to use a laptop as their one machine can present problems, and sharing laptops from a pool shifts the maintenance of the images from the classroom to the laptops.

Similar trade-offs exist with the “computer-in-the-classroom” model. The advantages are that the system is already hooked up and is generally started, saving time. The disadvantages are that the configuration might not match other systems the faculty member is using or that the classroom system might have problems the faculty member is not aware of, such as stolen or damaged equipment. On most campuses that support multiple computer platforms, the decision as to which type of model to use in the classroom can be difficult to make. Choosing both types is an expensive option.

Several institutions have created committees of faculty, staff, and students to focus on the issues of classroom design and renovation and have even created funds to renovate a few classrooms each year. These committees can help to create functional spaces and promote understanding that can lead to reasonable expectations and commitments for the IT organization. One institution estimates the cost of a classroom renovation to be $50,000–$75,000 per room, with the majority of the cost not being technology-related.

Finally, making classrooms reliable and consistent is a major challenge. Faculty indicate that they don’t have time to waste fiddling with technology that doesn’t work.

Reliability. Ensuring that technology classrooms are reliable is an ongoing challenge, especially since the number of rooms is growing despite recent constraints on institutional staffing. For example, campuses must maintain the integrity of the software images on the machines. One approach uses software automation to periodically refresh these images (e.g., Ghost, RevRdist, and Assimilator). An alternative approach uses software (e.g., Deep Freeze) to prevent modification of the images. The objective is the same: to ensure that the software will work in the same way for each faculty member, from one class meeting to another.

Given the number of such rooms and the many hours that they are used, it is unlikely that professional staff can check these rooms on a daily basis. Students to the rescue! Student help is commonly used to visit the classrooms and labs on a regular basis to determine if everything is working properly and to be sure that equipment has not “wandered away.” The effective management and training of these students is essential to achieving high levels of reliability. An interesting approach is the use of Web-based checklists that students complete when they visit a classroom. The checklist helps to ensure that the review is comprehensive and that problems get reported and solved quickly.

Consistency. If each room is reliable, faculty still need to be able to teach in different classrooms without having to learn new hardware and software configurations and ways of controlling them. This has been a big and expensive challenge, with many institutions moving to touchscreen control systems (e.g., Crestron, AMX) to put a predictable front-end on the various equipment.

Knowing that problems will arise, many institutions install telephones in each classroom so that help can be obtained quickly. Of course, this practice raises staffing issues, since there needs to be someone available to come immediately to the room. The goal of 100 percent uptime is unrealistic, but expectations run high, and the IT organization must put in place effective procedures to come as close to meeting them as possible.

Course Management Systems
Course management systems enhance the use of technology in the academic program. Though these systems are widely used, many institutions are dissatisfied with the current vendor-supported alternatives because of their high price, inconsistent service, and lack of needed features. Among those institutions utilizing the two most popular systems (Blackboard, WebCT), usage by faculty and students is increasing, largely because faculty perceive (1) savings in time and (2) opportunities to increase student engagement with course materials outside of class. The integration of course management systems with electronic reserves and campus portal products is another reason these systems are becoming more heavily used.

Among those institutions that are not using commercial course management systems, many have been providing similar functionality through separate products (e.g., folders for course materials, separate electronic reserves, discussion boards, and e-mail listservs) since the early 1990s. These institutions are also interested in the open-source alternatives that are currently under development (e.g., CourseWork, CHEF) at major research universities. These new products offer the hope of cost containment, although they require a support mechanism that doesn’t yet exist. The next few years will likely see much activity in this area if small colleges can find a way to ensure that adequate support will be available for these important instructional tools.
Campus-Wide Infrastructure and Services

Having a reliable, pervasive, robust infrastructure is the foundation on which all IT services are built. Get it right, and the opportunities are many, but get it wrong, and the institution will forever be responding to crises.

Networks

All of the institutions that I visited are heavily wired, including residence halls, although many are in the process of completing network upgrades to switched (versus shared) Ethernet in buildings and ensuring that connections exist in every building. Bandwidth management is a regular part of the efforts to respond to music- and video-sharing, with considerable time being spent trying various approaches. One institution used a software product called PacketHound, which not only manages bandwidth but terminates connections that violate policy guidelines (e.g., music-sharing).

Several institutions are taking proactive steps to minimize attacks from off campus by limiting access to on-campus computers from off campus. This approach opens up access only for those services that are defined as essential. Any exceptions must be approved in advance. This policy makes sense, since it is unlikely that the general student population can be counted on to protect their own machines, especially with the widespread peer-to-peer sharing that has become common.

Printing

Charging for printing is a hot topic on many campuses: about 25 percent of the institutions I visited have implemented or are seriously considering implementing a charging mechanism. Most are making duplex printing the default to conserve on paper, but with the heavy use of Web-based materials, including electronic reserves, there has been a significant increase in course-related printing and a shift away from duplicating on copy machines (which, interestingly, has always been a small revenue source for institutions). The rule of thumb seems to be that if you want to control or moderate printing costs, it doesn’t matter what you charge as long as you charge something.

Training

Training continues to be a puzzle for most institutions. Attendance at formal training classes remains inconsistent, Web-based training appears flexible but underutilized, and yet the need for ways to learn about technology continues to increase. Just-in-time training—that is, learning how to do a particular feature of software close to the time when you need to do it—seems to be most desired. The major constraints are the amount of time...
available for training, the availability of the audience, and the variety of technologies to be learned.

Among the interesting approaches being tried are “supported work times” and “study groups.” In the “supported work times” model, the IT organization advertises that members of its staff will be available for defined periods of time in a particular location and that anyone who needs help can stop by to receive it. This constrains the time in which help is available, but it has some of the benefits of just-in-time approaches.

The “study groups” approach builds on the desire for interaction with others while learning a more extensive amount of material. A small group of people, with a common interest in learning about a particular technology, select appropriate reading materials and meet on a regular basis. The group agrees on a schedule for readings, and the meetings are planned to go over the material and discuss points that are not clearly understood and to have individuals present how they solved problems. The group dynamic serves to motivate the learning much in the way that a personal trainer can help people maintain their exercise program. The group has access to experts when needed.

Modular Web-based training, (e.g., Element K) has been successfully used in connection with classes in which students are expected to have a certain level of competency in the use of a software product. For example, an economics professor indicates to students that they need to be proficient in the use of certain features of Excel by the third week of class. Given the varying backgrounds of the students, they can efficiently learn the features they don’t already know, even taking a self-test to confirm their understanding.

Institutions that have made the most progress in Web content maintenance have developed approaches that separate content from design.

Digital Asset Management
Institutions are at the early stage in thinking about how to efficiently manage the variety of information that is in electronic formats. Images, music, text, and video are regularly used to support the workings of the college and university. Converting these materials to digital form so that they can be accessed over the network has the potential for promoting efficiency and enhancing the academic program. Several institutions that have begun creating digital archives, mostly for still images, have utilized vendor-supported software. This approach has substantial staffing and licensing implications. At the same time, other institutions are experimenting with software that has promise for storing and managing a wider variety of digital assets, but this software is in its infancy.

The immediate issue that all campuses are facing involves how to efficiently provide for the storage and retrieval of these growing collections of digital materials. Because most of these materials relate to the rapidly increasing use of multimedia materials by faculty, there is an urgency to make progress.

The Web
All the institutions that I visited have recognized the importance of the Web as a means of providing access to information, simplifying processes, and building community. Some are further along in realizing the strategic value of their Web efforts, particularly in addressing the needs of external audiences, such as prospective students and alumni. Some have made the Web the foundation for entrance to all institutional processes via a portal. Yet only a few have been successful in turning these Web efforts into sustainable systems.

The institutions that have made significant progress have developed strong partnerships between the IT and the Public Relations Departments for management of the Web site. By “partnerships,” I mean that there are agreed-upon divisions of responsibilities building on the strengths and focus of each department. Whereas most institutions have recognized that both of these departments are stakeholders in creating an effective Web site, significant unresolved tensions exist between these two groups on many campuses, leading to duplicate work or lost opportunities. In a partnership, the IT organization is generally responsible for the technical programming and server maintenance while the public relations office oversees content and site visual design.

Institutions have recognized that they have thousands of Web pages, the content of which becomes out-of-date on a regular basis. Unlike print publications, Web pages are expected to be updated frequently. The typical approach to creating the content is decentralized—that is, the locus of responsibility for Web content maintenance is each individual department.

Institutions that have made the most progress in Web content maintenance have developed approaches that separate content from design so that people updating Web pages maintain site-consistent design and cannot accidentally disturb site navigation. The best approaches use templates, database-driven strategies for drawing content from institutional information systems, standardized updating tools such as Web editors, and content-management systems. Having found that full-blown content-management systems are very expensive, most institutions have programmed some of the key features of these systems themselves.
A particularly important strategy has been to draw Web site content from the institutional ERP systems. For example, rather than creating a list of names of the employees of a department as static Web content, this approach takes that information from the campus human resources system. The advantage is that the information is up-to-date and is maintained in only one place.

Several institutions have begun actively utilizing the Web for attracting prospective students, integrating their admissions information from the campus ERP system with their Web efforts to enhance personalization for each student. All known information about a student is brought to bear in the recruiting program, to provide an institutional picture that is tailored to the student's expressed interests. The efforts that are furthest along begin this personalization in the early stages of the student's search process and take it through the application stage, allowing students to access the status of their application on the Web. Some institutions are working on extending the Web interaction to help accepted students transition to the campus over the summer. These efforts involve collecting data from the students, providing opportunities for students to interact with faculty advisors, enabling students to easily supply needed information to the institution, and/or allowing students to utilize institutional IT resources, such as e-mail.

Using the Web to maintain relationships with alumni is common at the institutions I visited. Most have outsourced this service in the last decade (two popular vendors are Harris and IAC). Not surprisingly, the most heavily used services are the online alumni directory, discussion lists, and e-mail forwarding. Some institutions are considering bringing this service in-house by integrating it with their ERP systems. The development of a campus portal and the desire to maintain a consistent look for the alumni community and the on-campus community provide additional motivations for in-house development.

**Efficiency**

One hoped-for result of institutional spending on IT is institutional efficiency. The automation of existing processes has certainly occurred over many years, and no reasonably complex institution could claim that it functions without the use of IT. However, the rise of the Web interface, the integration of the Web with ERP systems, and advances in authentication technologies have now made it easier to eliminate—rather than automate—processes.

Most institutions have made course and biographical information available to students and their advisors over the Web. Web-based registration is now common. These approaches eliminate many processes (e.g., printing grade reports). Now, with the assistance of a portal, similar information can be provided to all members of the campus community and can be integrated with back-end ERP systems to improve overall institutional efficiency. For example, an institution can replace paper forms with Web forms that can dynamically check to see if information is correct, can fill in information based on knowledge of the person completing the form, and can then automatically update the necessary central databases after proper review.

Several institutions are moving the faculty-evaluation process by students to the Web. Concerns about potentially lower response rates and the anonymity of responses are being addressed in interesting ways by a few institutions. Among the approaches for ensuring high response rates is the withholding of access to grades until the evaluations are completed for all courses.

In some cases, the Web functionality is part of the ERP systems that institutions are implementing. In other cases, institutions are surrounding their existing central information systems with a Web front-end, perhaps with intermediate data warehouses. In any case, the result for the campus community is information that can be accessed through a well-understood interface and that can be tailored to the individual accessing it.

For most institutions, the portal is seen as the natural vehicle for encouraging efficiency. The next several years will see much activity in this area as the vendor portal market shakes out and as open-source products become more robust.

**General Observations**

I conclude with four general observations about these twenty-eight institutions as a group.

1. **These institutions offer ideal learning environments.** My visits to peer institutions confirmed why I've always loved my work at Hamilton and why I believe that many undergraduates do not fully appreciate the opportunities they have available at these liberal arts colleges and universities. Beautiful surroundings, small classes, close relationships with faculty and staff, and incredible resources make these institutions a potentially ideal learning environment. Students are privileged to be able to attend these colleges and universities. Technology is only one part of the equation.

2. **These institutions have not yet realized the potential for library-IT collaboration.** Cultural differences and competition for resources have been roadblocks to closer working relationships between library and IT organizations. Progress is being made, but much more can be done.

3. **At these institutions, culture trumps technology.** For all the talk about revolutions, these institutions proceed slowly and
with a measure of skepticism. The ideal nature of the learning environment minimizes some of the technology-use drivers present in large universities. In this incremental approach, the most significant impact on the academic program will come from the widespread use of basic tools, rather than from the big splash caused by a particular faculty member’s project. Also, a technique that works well in one institution may not always work well in another. Institutions have a history that reflects their culture, and culture requires time to change and a willingness to adapt.

4. At these institutions, IT excellence derives from infrastructure, organization, and people. I often returned from my early campus visits with a mixture of excitement and depression—excitement over what I had seen and depression over comparisons of the financial resources and staff of the other institutions with those of Hamilton. After visiting all the institutions, I conclude that excellence is most directly related to reliable infrastructure, good organization, and creative, service-oriented staff.

When I originally posed the idea of this odyssey to the members of the Hamilton College trustee technology committee, they thought it was a good, if significantly challenging, idea. They looked forward to hearing about how Hamilton compared with its peer institutions. However, they also asked: “What about the large research universities?”

Maybe next year. e

Notes
1. For the initial e-mail that I sent to my counterparts, see the appendix to the Web version of this article: <http://www.educause.edu/pub/er/erm04/erm041.asp>.

2. The peer group I chose was the top twenty-five institutions in the 2002 U.S. News ranking of national liberal arts colleges. Hamilton College was included in the list and competes for students with the institutions in this group. I also visited four additional campuses while I was “in the neighborhood.” The institutions are Amherst College (MA), Bates College (ME), Bowdoin College (ME), Bryn Mawr College (PA), Carleton College (MN), Claremont-McKenna College (CA), Colby College (ME), Colgate University (NY), Davidson College (NC), Denison University (OH), Grinnell College (IA), Harvey Mudd College (CA), Haverford College (PA), Kenyon College (OH), Macalester College (MN), Middlebury College (VT), Mount Holyoke College (MA), Oberlin College (OH), Pomona College (CA), Smith College (MA), St. Olaf College (MN), Swarthmore College (PA), Trinity College (CT), Vassar College (NY), Washington and Lee University (VA), Wellesley College (MA), Wesleyan University (CT), and Williams College (MA).

RELATED RESOURCE
The EDUCAUSE Small Colleges Constituent Group (http://www.educause.edu/cg/smallcol.asp) discusses IT issues that are unique to institutions with an FTE enrollment under 5,000. The goal is to promote the sharing of problem solutions and successful techniques related to the planning and management of technology-related information resources.